DEPARTMENT OF COMMERCE PUBLICATION

Marine Fisheries Abstracts

U.S. DEPARTMENT OF COMMERCE
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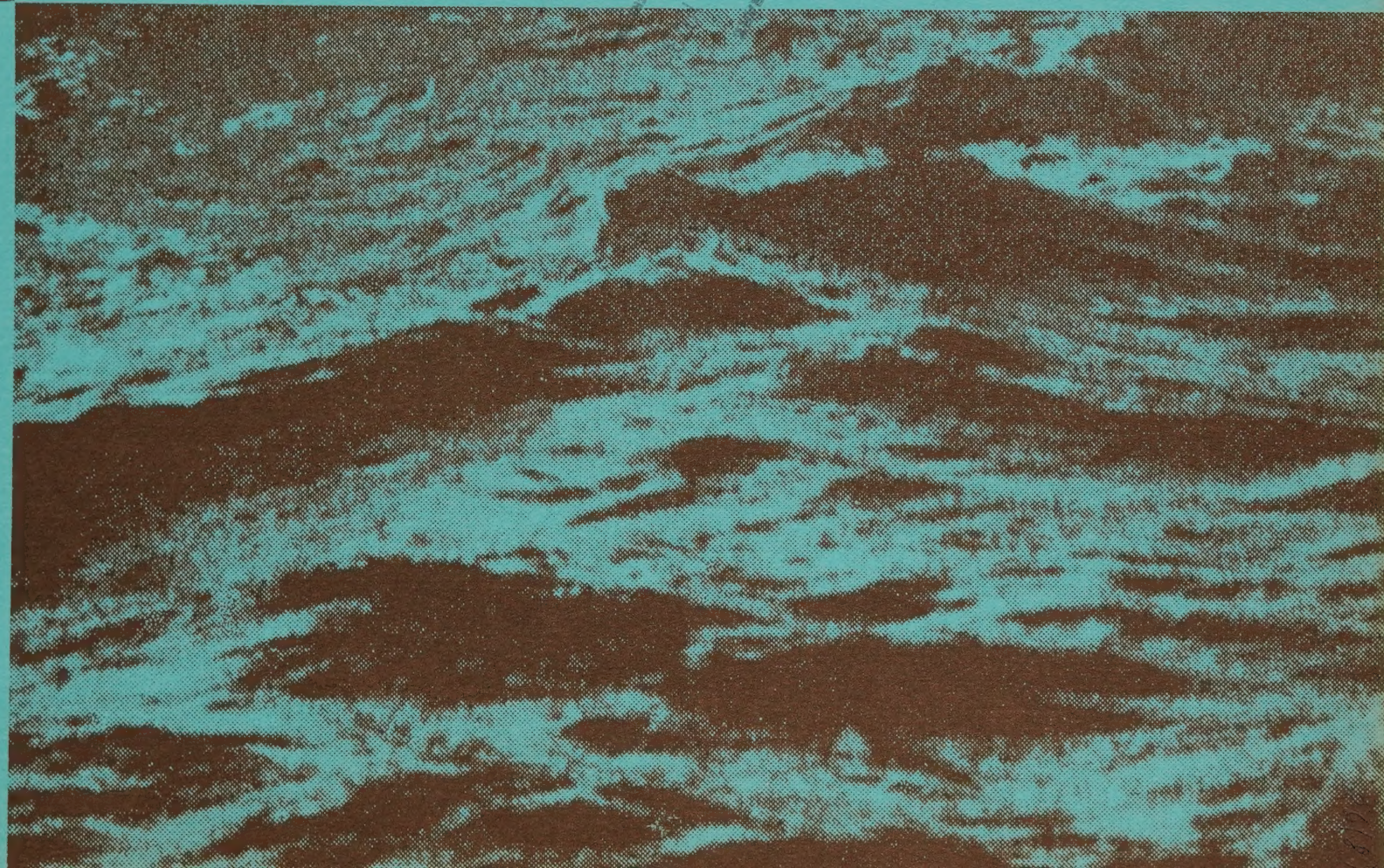
National Marine Fisheries Service



AUGUST 1973

VOLUME 26
NUMBER 8

Seattle, Wash.

UNITED STATES DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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FOREWORD

The Department of Commerce's National Marine Fisheries Service publishes the monthly journal *Marine Fisheries Abstracts* as one means of communicating to the fishing industry and allied groups the status of current fishery research. The research includes the biological aspects of fishery science as well as technological studies dealing with aquatic resource supply, harvesting, processing, utilization, and distribution.

Marine Fisheries Abstracts contains summaries of selected articles from trade, engineering, and scientific journals dealing with the entire spectrum of fishery science. The publication is designed to serve the needs of fishery scientists, engineers, and managers in industry, academic institutions, and government by supplying timely information on current progress in fishery research and technology.

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0.33 FREEZING BEHAVIOR OF FISH BLOOD GLYCOPROTEINS WITH ANTIFREEZE PROPERTIES

Raymond, J. A., and A. L. DeVries (Scripps Institution of Oceanography, University of California, La Jolla, CA 92037)
Cryobiology 9, No. 6, 541-547 (Dec. 1972)

The ability of polar fishes to resist freezing has been attributed in other reports either to supercooling of the blood or to increased levels of sodium chloride or glucose in the blood. One of the authors (DeVries) previously reported that large molecular weight (MW) glycoproteins, found only in Antarctic species, lowered the blood freezing point of some of these fishes. In continuing work on glycoproteins, studies were performed on freezing curves of serum and glycoprotein solutions, the effect of glycoproteins on the structure of ice, and the relation of freezing point depression (FPD) to the rate of freezing and MW of participating compounds.

Serum and glycoprotein were obtained from Antarctic fishes by the method of DeVries [A. L. DeVries, S. K. Komatsu, and R. E. Feeny. J. Biol. Chem. 245, 2901-2908 (1970)]. Freezing curve studies were conducted on 0.5 ml. samples with ice crystals. Glycoproteins of known MW were cleaved by incubating with subtilisin. Average MWs were determined by obtaining the total number of amino groups in the molecule remaining after cleavage.

The freezing curves of large MW glycoproteins showed a flat section indicating a long period before freezing was complete. The smaller MW glycoproteins exhibited

0.33 FLUORESCENT PRODUCTS IN A GLUCOSE-GLYCINE BROWNING REACTION

Adhikari, H. R., and A. L. Tappel (Dept. of Food Science & Technology, University of California, Davis, CA 95616)
Journal of Food Science 38, No. 3, 486-488 (Mar.-Apr. 1973)

Earlier published studies have described the development of fluorescent products in nonenzymatic browning reactions and have demonstrated that the fluorogens are precursors of the brown pigments, but are not identical with them. Because browning does not affect the formation of fluorescent products and the resultant deterioration of nutritional quality, measurement of fluorescence might be more useful than browning to assess nutritional quality. The purpose of the present study was to find out whether fluorescence could be used as a quantitative measure of the browning reaction and to partially identify the associated fluorescent chromophores. The reaction system was based on that of H. S. Burton, D. J. McWeeny, and D. O. Bitcliffe [J. Food Sci. 28, 631 (1963)]. Aqueous solutions of glucose and glycine (2 and 1 molar, respectively) mixtures were heated at 100° C. (pH 5.0-5.2), and aliquots were removed at periodic intervals and analyzed with a spectrophotofluorometer. In addition, the effects of pH and metal chelating agents on the fluorescent products were examined. The pH of the diluted reaction mixture was adjusted with 1N NaOH and 1N HCl. The metal chelating agent used was Europium III 2,2,6,6-tetramethyl heptane-1-3-dione.

Fluorescence spectra of the products (and the results of the effects of pH and metal chelation on the fluorescence) indicated that the chromophoric group is a

0.35 STRUCTURE OF THE LIPID PHASE IN CELL ENVELOPE VESICLES FROM HALOBACTERIUM CUTIRUBRUM

Esser, Alfred F., and Janos K. Lanyi (Biological Adaptation Branch, Ames Research Center, National Aeronautics and Space Administration, Moffett Field, CA 94035)
Biochemistry 12, No. 10, 1933-1939 (May 8, 1973)

The bacterium H. cutirubrum is extremely halophilic and requires sodium chloride levels of at least 3 M for growth; it lyses readily when the salt level is less than 1 M. The envelop of the cell of this organism is made up mostly of lipoproteins and contains over 90% of the cellular phosphorus. The major phospholipid is phosphatidyl glycerophosphate which contains two ether-linked long phytanyl side chains. The remaining lipids and carotenoids are phytyl derivatives; thus, the authors state, the hydrocarbon part of the membrane seems to be fairly uniform. These bacteria are able to accumulate potassium ions against a large concentration gradient. The intracellular potassium, at a concentration of almost 3 M, is not bound to an intracellular matrix. This organism, because it does not have a rigid cell wall and because of the remarkable physicochemical and metabolic properties of its cell envelope, is a valuable tool for investigating structure-function relationship in membranes. In the present study, the researchers examined the physical state of the lipid phase in the cell envelop of H. cutirubrum by incorporating spin-labeled fatty acids into membrane vesicles. Fatty acid derivatives of the general formula $CH_3(CH_2)_m$-$CR(CH_2)_n COOH$ (R = N-oxyl-4',-4'-dimethyloxazolidine) were used as probes.

0.35 (9.16) PARADOXICAL EFFECTS OF SALINITY REDUCTIONS ON LOBSTERS (HOMARUS AMERICANUS) INFECTED WITH GAFFKYA HOMARI

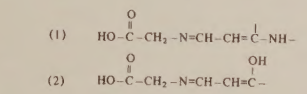
Stewart, James E., and B. Arie (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia, Canada)
Comparative Biochemistry and Physiology 45, No. 3A, 717-730 (July 1, 1973)

Although lobsters can adapt to a relatively wide range of salinity, they adapt to reductions in environmental salinity rather slowly. Inasmuch as many lobsters live in coastal areas near the shore where salinity changes can be frequent and rapid, they must be able to cope with these naturally occurring stress factors. It is possible that the stress factor could be extremely severe for those lobsters held captive in inshore commercial holding pens where runoff from the land can bring out rapid changes in the salinity of the shallow water. The fatal bacterial disease gaffkemia (caused by Gaffkya homari) may impose an additional stress. This paper dexcribes the effects that reductions in salinity from a normal coastal value of 31.8 ‰ had on the time to death of lobsters infected with G. homari and the resulting physiological changes in the hemolymph of infected and healthy lobsters.

When the lobsters were first acclimated to reduced environmental salinities of 26.1 ‰ and to 21.5 ‰ prior to their infection with G. homari, their times to death were shortened to 9 and 5 days, respectively, from the 13 days recorded at the coastal (normal) salinity of 31.8 ‰. However, when the lobsters were first infected with the organism and then acclimated to a salinity of 26.1 ‰, their times to death

0.33

Schiff-base in conjugation with an electron donating group. The fluorescence products were mainly polymers. The structure of the chromophoric system could be:



The researchers examined several foods (including breakfast cereal, toasted white bread, coffee) which undergo carbonyl-amine reactions during processing and found that they contained similar fluorescence products. The authors suggest that fluorescence can be used as a quantitative measure of the browning reaction.
[4 figures, 15 references]

FTP

0.35 (9.16)

increased progressively from the sixth day of infection onward. Reduction of infected lobsters to a salinity of 21.5 ‰ increased the time to death to 18-20 days. The authors were not able to offer a logical explanation for these results.

Information is given on hemolymph total carbohydrates, glucose, lactic acid, serum osmolalities, and pathogen numbers that were measured during the course of the experiments.
[13 figures, 23 references]

FTP

0.35 (1.85) BIOSYNTHESIS OF ASTAXANTHIN. VI. CAROTENOIDS IN THE PRAWN, PENAEUS JAPONICUS. II.

Katayama, Teruhisa, Tadashi Katama, and C. O. Chichester (Fac. Fish., Univ. Kagoshima, Kogoshima, Japan)
Chemical Abstracts 78, No. 7, 40658n (Feb. 19, 1973)

0.33

freezing curves that were not as flat and were not effective in FPD as the larger MW glycoproteins. The authors found that the FPD produced by glycoproteins is closely related to their affinity for ice; that is, the more active, larger glycoproteins have a higher affinity for ice than the smaller. The authors attribute this characteristic to binding of hydroxyl groups on the glycoprotein to oxygen molecules on the ice. For smaller MW glycoproteins, lowering the freezing point was found to be dependent on the rate of freezing; that is, the lower the temperature, the faster heat is removed from the sample and the faster it freezes. This response is not found in larger MW glycoproteins. Studies on the freezing curves of serum yielded indications that it behaved as if it were supercooled; that is, there was variability in the freezing point. In addition, at faster freezing rates, the serum behaved in a fashion similar to lower MW glycoproteins. Since 80% of the serum consisted of low MW glycoproteins, this result was expected.
[6 figures, 18 references]

SW

0.33 EFFECT OF HEATING ON THE HYDROLYSIS OF FISH CONNECTIVE TISSUE

Sadukasov, T. S. (Astrakh. Tekh. Inst. Rybn. Prom. Khoz., Astrakhan, U.S.S.R.)
Chemical Abstracts 78, No. 7, 41723s (Feb. 19, 1973)

0.35

The membranes of the cell envelop of H. cutirubrum differed from isolated lipids in that (1) the polarity around the spin-label group of labels where [m,n] = [12,3], [7,6], and [5,10] is considerably higher in membranes than in lipids, (2) the order parameter, S_n, in membranes is unusually high and nearly constant for $n < 14$, while in lipids the usual flexibility gradient was observed for this region, and (3) thermal transitions for labels [12,3] and [5,10] occurring in lipid dispersions, as evidenced by the temperature dependence of $\underline{S}$ or of the motion parameter, τ, are absent in membranes. For label [1,14], the environment around the nitroxyl group was similar in both membranes and extracted lipids, and a thermal transition occurred at the same temperature in both systems. It appears that in H. cutirubrum cell envelopes the membrane proteins cause all but a narrow center portion of the lipid bilayer to become more ordered. Inasmuch as the lipid content of these membranes is low (lipid to protein ratio is <0.2), the authors think it possible that such immobilization is due to the existence of a protein matrix in the membrane.
[6 figures, 2 tables, 41 references]

FTP

0.35 (2.2) FORMATION OF NONVOLATILE AMINES DURING LOSS OF FRESHNESS AND PUTREFACTION IN VARIOUS SPECIES OF SHELLFISH MUSCLE

Takagi, Mitsuzo, Atsushi Iida, Hanako Murayama, and Suga Soma (Fac. Fish., Hokkaido Univ., Japan)
Chemical Abstracts 78, No. 7, 40755s (Feb. 19, 1973)

0.39 STUDIES ON THE DISCOLORATION OF RED FISHES

Tsukuda, Nobuo
Bulletin of Tokai Regional Fisheries Research Laboratory, Tokyo, Japan, No. 70, 103-174 (Aug. 1972) (In Japanese, English abstract)

The skin of food fish such as the rockfishes (Sebastes spp.), the gurnards (Chelidonichthys kumu and Lepidotrigla güntheri), and others contain red colors which fade during storage, transport, and processing. Consumers in Japan rely on the unfaded color in these fishes as an indicator of freshness. The color in the red fishes is due to carotenoid and melanoid pigments. Since melanoid pigments are stable, the author concluded that discoloration of the red color is due to changes in the carotenoid pigments. To determine the cause of the changes, the carotenoids and their concentrations in red fishes were investigated.

Astaxanthin was found to be the predominant variety of carotenoid in the color of the red fishes; it comprised more than 50% of the total carotenoids. In addition, tunaxanthin was found to be the other major component of the carotenoids in the red fishes. A small quantity of violaxanthinlike pigment, and some unidentified pigments, may be present also.

Tests of color retention were performed on red fishes in iced and in frozen storage. Fishes in iced storage kept their color for 5 to 8 days; after this period they began to lose their colors. Fish kept at -3° C. were discolored during 35 days of storage. At -18° and -30° C. discoloration could not be stopped after 50 and 75 days, respectively, of storage. Astaxanthin isolated from fish skin was found to be discolored upon exposure to ultraviolet light. Wrapping the container

0.5 (2.05) EFFECT OF SELECTED LACTIC ACID BACTERIA ON GROWTH OF STAPHYLOCOCCUS AUREUS AND PRODUCTION OF ENTEROTOXIN

Haines, William C., and L. G. Harmon (Dept. of Food Science and Human Nutrition, Michigan State University, East Lansing, MI 48823)
Applied Microbiology 25, No. 3, 436-441 (Mar. 1973)

Certain bacteria are able to inhibit the growth of S. aureus. Some lactic acid producing organisms inhibit both growth of S. aureus and its production of enterotoxin when grown in associative culture. Although the pH of mixed cultures is indicative of the potential for growth of the staphylococci, it is not clear whether the inhibition of growth is related to the production of lactic acid. This study examined the ability of certain lactic acid bacteria to affect growth and production of toxin by enterotoxigenic staphylococci.

S. aureus 243, which produced enterotoxin B, was used. The effector organisms used were Streptococcus lactis A62, A64, A254, G18, W, C24, and 11454; S. cremoris E8 and S. thermophilus W; Pediococcus cerevisiae FBB39, FBB63, 10791, and "accel"; Lactobacillus casei 54, L. plantarum FBB12, and L. bulgaricus W; and Leuconostoc citrovorum W. The Staphylococcus aureus 243 and effector organism were grown in associative culture in APT broth.

The streptococci inhibited both growth of S. aureus and production of enterotoxin to a greater degree than did any of the other lactic acid bacteria; the P. cerevisiae were next in degree of effectiveness. The lactobacilli and Leuconostoc citrovorum did not inhibit growth of S. aureus and only slightly inhibited production of enterotoxin. Enterotoxin was present in all cultures in which the population of S. aureus reached 8×10^7 per milliliter; no enterotoxin was detected when

0.5 (3.33)(2.05) EFFECT OF NITRITE AND NITRATE ON TOXIN PRODUCTION BY CLOSTRIDIUM BOTULINUM AND ON NITROSAMINE FORMATION IN PERISHABLE CANNED COMMINUTED CURED MEAT

Christiansen, L. N. (Swift and Company, Research and Development Center, Oak Brook, IL 60521), R. W. Johnston, D. A. Kautter, J. W. Howard, and W. J. Aunan
Applied Microbiology 25, No. 3, 357-362 (Mar. 1973)

The purpose of this overall collaborative study was to determine the minimal levels of nitrite or nitrate, or both, necessary for the control of botulinal toxin production in several types of cured meat products. This paper, the first in a series, reports on comminuted ham. Comminuted ham (containing added sodium chloride, 2.5%; dextrose, 0.5%; and sodium isoascorbate, 0.02%) was formulated to contain different levels of sodium nitrite and sodium nitrate, inoculated with spores of C. botulinum, packed in cans under vacuum, and pasteurized to an internal temperature of 68.5° C. Nitrite was tested at seven levels (50, 100, 150, 200, 300, 400, and 500 µg./g.), and nitrate was tested at three levels (500, 1,000, and 2,000 µg./g.). Current federal regulations permit up to 200 µg. of nitrite per gram of meat, and 500 µg. nitrate per g. of meat. Two inoculum levels were used of about 100 and 10,000 spores per g. of meat. Holding temperature was 7° C. and 27° C.; storage period was 168 days.

The levels of nitrite, upon addition to the meat, decreased; cooking had little effect on the levels. Nitrite levels decreased more rapidly during storage of the samples at 27° C. than at 7° C. The amount of nitrite added to the comminuted ham greatly influenced the growth of and the toxin production of C. botulinum. Also,

0.5 GROWTH AND ENTEROTOXIN PRODUCTION BY VARIOUS STRAINS OF STAPHYLOCOCCUS AUREUS IN SELECTED FOODS

Scheusner, D. L., and L. G. Harmon (Dept. of Food Science & Human Nutrition, Michigan State University, East Lansing, MI 48823)
Journal of Food Science 38, No. 3, 474-476 (Mar.-Apr. 1973)

Earlier work indicated that growth of S. aureus sometimes occurred in foods without detectable amounts of enterotoxin being formed. It appears that the presence of competitive organisms may have a major effect on enterotoxin production. In the present study, the researchers examined the potential for growth and enterotoxin production by various strains of S. aureus inoculated into various food products. Various strains of S. aureus were inoculated into different commercial food products, and the test samples were then incubated at 21° C. for from 48 to 119 hr. The food samples included doughnut and jelly; pastry cream fillings; salad dressing; creamed herring; ham salad; frozen beef, chicken, tuna, and turkey pot pies; canned beef stew; cream pies; rice pudding; and others.

Foods in which measurable amounts of enterotoxin were found had an initial pH of 5.1 to 6.60, and the terminal S. aureus count ranged from 1.7×10^7 to 5.7×10^8. The initial total bacterial count of these same foods varied from <10 to 3.0×10^2 per gram, and the terminal total bacterial count varied from 7.9×10^7 to 4.3×10^9. During incubation of inoculated foods with an initial pH below 5.0, there was a decrease in the S. aureus population, and the total bacterial population either decreased or remained stable. The authors found that the various strains of S. aureus

0.5 (3.33)(2.05)

the level of nitrite required to effect complete inhibition depended upon the inoculum level. There was no botulinal toxin production or putrefaction in the samples stored at 7° C. for 6 months. Toxin was produced in samples containing 150 μg. nitrite per g. sample and an inoculum of 90 spores per g. sample; no toxin production occurred in samples with the same size inoculum but formulated with 200 μg. nitrite per g. Toxin was detected in samples containing 400 μg. nitrite per g. and inoculated with 5,000 spores per g.; toxin was not found in samples with the same size inoculum but formulated with 500 μg. nitrite per g.

Analyses of selected comminuted ham samples containing different levels of nitrite or nitrate, or both, gave negative results for 14 volatile N-nitrosamines at a sensitivity of 0.01 μg. of nitrite or nitrate per g. of meat. The analyses were made for the following volatile N-nitrosamines: dimethylamine, methylethylamine, diethylamine, methylpropylamine, ethylpropylamine, dipropylamine, ethylbutylamine, propylbutylamine, methylamylamine, dibutylamine, piperidine, pyrrolidine, morpholine, and diamylamine.

These data show clearly that nitrite significantly inhibits production of toxin by C. botulinum in perishable canned comminuted cured ham if the product is temperature abused. Also, the nitrite level in the meat product at the time of formulation is important rather than the residual nitrite level in the product during storage.
[3 figures, 6 tables, 19 references]

FTP

0.5

used produced enterotoxins A, B, C, and D in vanilla pudding with initial pH of 6.37 over a temperature range of 19°-45° C.

Thus, growth of S. aureus may occur without production of enterotoxin. Enterotoxin production appears to have some relationship to pH but not to the kind of food in which growth occurred. For example, enterotoxin was produced in inoculated sweet potato (pH 5.51) and in inoculated coconut cream pie (pH 6.60), but no measurable enterotoxin was produced in any food with a pH below 5.0.
[3 tables, 12 references]

FTP

0.39

in red-colored cellophane prevented discoloration of the astaxanthin upon exposure to sunlight. The discoloration rate differed with the solvent that was mixed with astaxanthin. Discoloration was rapid with chloroform and acetone and less rapid with petroleum ether, benzene, and glacial acetic acid; astaxanthin was fairly stable with ethyl ether, ethanol, methanol, and carbon disulfide. Aqueous extracts of skin, liver, and muscle tissue from various fishes were tested for their ability to discolor the carotenoids. Skin extracts had strong ability to discolor, and muscle and liver extracts were not very active. The author concluded that the skin tissues contain a lipoxidaselike enzyme which participates with other physical and chemical activity in causing discoloration of the carotenoids.
[59 figures, 19 tables, 73 references]

SW

0.5 (2.05)

the S. aureus population was less than 4×10^7 per ml. It appears that competition for vital nutrients, particularly niacin and biotin, and the production of hydrogen peroxide may contribute to the inhibition. The production of lactic acid by the associative organisms appears to inhibit the growth of S. aureus in the early stages of incubation but not in the later stages.
[2 figures, 5 tables, 21 references]

FTP

0.39 INORGANIC CONSTITUENTS PRESENT IN DNA AND RNA

Hamilton, E. I., and M. J. Minski (Radiol. Prot. Serv., Belmont/Sutton, Surrey, England)
Chemical Abstracts 78, No. 7, 39524j (Feb. 19, 1973)

0.5 (4.2) PHYSICOCHEMICAL AND ANTIBACTERIAL PROPERTIES OF DIFFERENT WHALE FAT FRACTIONS

Lyubeznov, V. N., and S. S. Popova (U.S.S.R.)
Chemical Abstracts 78, No. 7, 38710e (Feb. 19, 1973)

0.5 CONTROL OF STAPHYLOCOCCUS AUREUS IN SAUSAGE BY STARTER CULTURES AND CHEMICAL ACIDULATION

Daly, C., Michele La Chance, W. E. Sandine, and P. R. Elliker (Dept. of Microbiology, Oregon State University, Corvallis, OR 97331)
Journal of Food Science 38, No. 3, 426-430 (Mar.-Apr. 1973)

Successful production of certain fermented sausage products (thuringer, cervelat, pepperoni) requires strong fermentation to give the desired preservative, flavor, and texture characteristics. Some manufacturers use starter cultures of suitable lactic acid bacteria; recently cultures of Pediococcus cerevisiae were made available commercially in frozen form. Starter cultures improve the uniformity of sausages and shorten the production cycle. The presence of Staphylococcus aureus in sausage products can pose a serious public health problem. In this study, the researchers examined the effect of commercially available starter cultures on the growth and survival of S. aureus in sausage meat product incubated at 21°, 30°, and 37° C. Also, tests were carried out using citric acid and glucono-delta-lactone (GDL) as acidulants with and without added starter culture. The test sausage mixture consisted of cold ground beef base, glucose, salt, and sodium nitrate. For the inoculated packs, appropriate dilutions of an 18-24 hr. culture of S. aureus were added to the sausage mixture. Starter cultures were then added to the sausage emulsion. The test samples were placed in 50-ml. beakers, which were then covered and stored at 21°, 30°, or 37° C. When the chemical acidulants were used, they were added to the sausage emulsion prior to the addition of the culture of S. aureus. The starters used were P. cerevisiae, Lactobacillus plantarum, and a mixture of the two.

0.5 (2.05) PHENOTYPIC CHARACTERIZATION OF BENECKEA PARAHAEMOLYTICA: A PRELIMINARY REPORT

Baumann, Paul, and Linda Baumann (Dept. of Microbiology, University of Hawaii, Honolulu, HI 96822)
Journal of Milk and Food Technology 36, No. 4, 214-219 (Apr. 1973)

The nutritional, physiological, and morphological characteristics of eighty-six strains of bacteria that had been isolated from cases of gastroenteritis and that had the general properties of the genus Beneckea were examined. These strains, which included the type strain of Beneckea parahaemolytica, were phenotypically homogeneous and distinguishable from the other known species of Beneckea by multiple, unrelated, phenotypic traits. The authors also discuss the validity of some of the traits previously used to identify B. parahaemolytica and the possible difficulties encountered in the identification of this organism from marine sources. [17 figures, 3 tables, 19 references] FTP

0.5 (2.05) RADIOIMMUNOASSAY FOR TYPE A TOXIN OF CLOSTRIDIUM BOTULINUM

Boroff, Daniel A., and Gregory Shu-Chen (Research Immunology Laboratory, Albert Einstein Medical Center, Philadelphia, PA 19141)
Applied Microbiology 25, No. 4, 545-549 (Apr. 1973)

Because C. botulinum toxin is extremely potent, an effective laboratory assay procedure for it must be rapid, specific, and sensitive; such properties are found in the radioimmunoassay of S. A. Berson and R. S. Yalow [Radioimmunoassay Hosp. Pract. 3, 73 (1968)]. The technique is based on the competition between radiolabeled and unlabeled antigen for binding to specific antibody. The ratio of bound to free labeled antigen is decreased as the concentration of the unlabeled antigen is increased. The level of toxin in the unknown sample is obtained by comparing the inhibition observed in the sample with that produced in standard solutions containing known amounts of the antigen. This radioimmunoassay must be carried out with preparations of high purity and high specific radioactivity. The purpose of the present study was to examine the possibility of radiolabeling the toxin of C. botulinum type A (because it is available in pure form) and using it in a radioimmunoassay.

Pure type A toxin of C. botulinum was labeled with ^{131}I in the presence of chloramine-T and carrier-free isotope. The oxidizing agent chloramine-T liberates free I which in turn substitutes into tyrosine residues of the protein. The radioactive toxin was used in a radioimmunoassay procedure similar to that of Berson and Yalow. Dilutions of antibody to the toxin, capable of binding 50% of the added

0.5 (2.05) VIBRIO PARAHAEMOLYTICUS--ISOLATION, IDENTIFICATION, CLASSIFICATION, AND ECOLOGY

Colwell, R. R., T. E. Lovelace, L. Wan, T. Kaneko, T. Staley, P. K. Chen, and H. Tubiash (Dept. of Biology, Georgetown University, Washington, DC 20007)
Journal of Milk and Food Techology 36, No. 4, 202-213 (Apr. 1973)

V. parahaemolyticus was isolated and identified from samples of water, sediment, blue crabs, oysters, and clams from several areas of Chesapeake Bay. The isolates implicated in recent outbreaks of food poisoning in the United States were shown (by use of DNA/DNA reassociation measurements) to be closely related to Japanese and other isolates collected in the United States. Distribution of V. parahaemolyticus seems to be in the coastal and estuarine regions. The organism is closely associated with the zooplankton in Chesapeake Bay; rhythmic cycles of occurrence in the water column parallel with the appearance of plankton blooms were demonstrated. [15 figures, 3 tables, 33 references] FTP

0.5 (2.05)

radioactive toxin, were mixed with a sample of the labeled toxin and various concentrations of the unlabeled toxin. When the level of unlabeled toxin was plotted against the ratio of (radioactive toxin bound)/(radioactive toxin not bound), a standard curve was obtained that could be used to estimate the concentrations of unlabeled toxin in a test mixture. The assay is sufficiently sensitive to detect as little as 100 mouse minimum lethal dose (or 0.1 ng.), and it is highly specific for the serological type of the toxin used.
[4 figures, 2 tables, 7 references] FTP

0.5 (3.33)(2.05) EFFECT OF FROZEN STORAGE TIME ON HEAT INACTIVATION OF CLOSTRIDIUM BOTULINUM TYPE E TOXIN

Yao, Modesto G., Cleve B. Denny, and C. Wallace Bohrer (National Canners Association Research Foundation, Washington, DC 20036)
Applied Microbiology 25, No. 3, 503-505 (Mar. 1973)

When type E toxin of C. botulinum was stored in the frozen state (-15° C.), the toxin retained its original toxicity level but lost its stability to heat as the storage time increased (total storage time 264 days). Therefore, the maximum heat stability of type E C. botulinum toxin is with the freshest toxin, and heat-inactivation tests on the toxin should not be conducted with toxins stored frozen more than 1 week.
[1 figure, 1 table, 4 references] FTP

0.5

The starter cultures inhibited growth of S. aureus (initial inoculation of 30,000 and 190,000 bacteria per gram) greater than 99% (as compared to growth of the organism in the control sample that did not contain added starter or acidulant) after 50 hr. of incubation at 37° C., inhibited S. aureus at 30,000/g. greater than 99% at 30° C., and greater than 97% at 21° C. The test samples containing added chemical acidulants only (0.75% GDL plus 0.1% citric acid) showed good initial control of S. aureus but extensive growth of the organism occurred by 50 hr. of incubation. Test samples containing added starter culture and chemical acidulants gave about 99.99% inhibition of S. aureus (percent inhibition compared to inoculated control sample).

The authors conclude that properly selected, physiologically active starter cultures will not only improve the uniformity of certain sausage products and shorten production cycles, but will also ensure the safety of the meat product. Commercially available cultures, too, are convenient to use and do not require special handling procedures.
[7 tables, 23 references] FTP

0.5 (7.86)(9.15) FISH VIRUSES: BUFFERS AND METHODS FOR PLAQUING EIGHT AGENTS UNDER NORMAL ATMOSPHERE

Wolf, Ken, and M. C. Quimby (Eastern Fish Disease Laboratory, Bureau of Sport Fisheries and Wildlife, U.S. Dept. of the Interior, Kearneysville, WV 25430)
Applied Microbiology 25, No. 4, 659-664 (Apr. 1973)

The purpose of this study was to develop a plaque assay for eight fish viruses [bluegill myxovirus, channel catfish virus, eel virus, Egtved virus, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, lymphocystis virus, and the agent of spring viremia of carp (Rhabdovirus carpio)], in dish cultures of various fish cells. This paper describes such a procedure, including the medium, which supports both cell growth and viral replication in normal atmosphere of the eight fish viruses.
[1 figure, 6 tables, 14 references] FTP

0.5 (6.54) EFFECTS OF SYNTHETIC MEAT COMPONENTS ON GROWTH OF CLOSTRIDIUM PERFRINGENS

Schroder, D. J., and F. F. Busta (Dept. of Food Science and Nutrition, University of Minnesota, St. Paul, MN 55101)
Journal of Milk and Food Technology 36, No. 4, 189-193 (Apr. 1973)

Earlier work showed that components added to soy protein base in fabricating synthetic soybeef stimulate the growth of C. perfringens. The purpose of the present study was to determine which of the components in soybeef (when added to soy protein) have the major influence on the growth rate of the organism. The 16 ingredients were added to the soy protein base in a formulation similar to that in the commercial product. These ingredients consisted of vegetable oil, beeflike flavor, egg white, corn flour, sugar, caramel, cocoa, onion powder, sodium chloride, calcium phosphate, ferric pyrophosphate, sodium lauryl sulfate, niacin, riboflavin, vitamin B_6, and vitamin B_{12}. The effects of individual ingredients on the growth of C. perfringens was evaluated by use of a screening fractional factorial design (O. L. Davies, The Design and Analysis of Industrial Experiments, Ed. 2, Hafner Publishing Co., New York, N.Y. (1967)].

Four of the 16 ingredients stimulated the growth of C. perfringens: beeflike flavor, corn flour, cocoa, and vegetable oil. The rest of the ingredients showed no effect. The authors state that these results indicate the potential importance of a few key ingredients of a fabricated food in influencing the growth rate of a potentially pathogenic organism.
[2 figures, 5 tables, 10 references] FTP

0.6 (6.195) ESSENTIAL AMINO ACID LEVELS FOR STARTING TURKEY POULTS

Warnick, Robert E., and Jay O. Anderson (Utah State University, Logan, UT 84321)
Poultry Science 52, No. 2, 445-452 (Mar. 1973)

The purpose of this work was to determine what levels of essential amino acids are needed to make a well-balanced ration for turkey poults. Semipurified diets were fed to Broad Breasted Bronze turkey poults; the protein portion of the diets consisted of herring meal, soybean meal, wheat gluten, gelatin, and crystalline amino acids. The protein level of the diets was 28% (nitrogen x 6.25) and the metabolizable energy of the diets was 3,050 kcal./g. The estimated minimum requirements of essential amino acids are (expressed as percentage of the diet): arginine, 1.60; histidine, 0.58; lysine, 1.68; leucine, 1.86; isoleucine, 1.10; valine, 1.20; phenylalanine and tyrosine, 1.80; tryptophan, 0.26; methionine and cystine, 1.04; and threonine, 1.00.
[1 figure, 5 tables, 6 references] FTP

0.7 (9.19) THE COMPARATIVE EFFECT OF ORAL INGESTION OF METHYL MERCURY ON CHICKS AND RATS

Soares, J. H., Jr., David Miller, H. Lagally, B. R. Stillings, P. Bauersfeld, and S. Cuppett (College Park Fishery Products Technology Laboratory, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, College Park, MD 20740)
Poultry Science 52, No. 2, 452-458 (Mar. 1973)

The purpose of this study was to find out (1) whether the low levels (0.3 to 0.4 p.p.m.) of mercury found in some fish meals were hazardous to broiler chickens, (2) the effects of various levels of methyl mercury ingested by broilers over a period of from 4 to 7 weeks, and (3) the effects of the same levels of methyl mercury on rats over a period of 12 weeks. In the first experiment with chicks, three diets were fed. The first two were semipurified diets in which the sole source of protein was soybean meal or fish meal, with the protein level of the diet at 12%. The third diet was a corn-soybean ration supplemented with 5% fish meal and 5% meat and poultry meal; it contained 23% protein, representing a practical feeding regime. In the second experiment, the chicks were fed diets containing 0, 0.50, 1.02, 2.19, 5.09, 7.80, or 16.88 p.p.m. mercury (as methyl mercuric chloride), with soybean meal as the sole source of protein and with added methionine. Weanling white rats were fed four of these same diets containing added methyl mercuric chloride (0.05, 0.99, 2.85, and 16.00 p.p.m. of mercury).

Feeding the chicks fish meal containing higher than normal levels of mercury did not result in the concentration of mercury in the poultry tissues that exceeded FDA guideline levels. The level of mercury in the chicken breast muscle averaged

0.7 (0.4)(9.19) MERCURY LEVELS IN THE BLOOD AND HAIR OF INDIVIDUALS EATING METHYLMERCURY-CONTAMINATED FISH

Anonymous
Nutrition Reviews 31, No. 2, 53-55 (Feb. 1973)

The two major sources of recent human intoxication with mercury have been the consumption of seed grain treated with organic mercury fungicides and, in Japan, the consumption of fish and shellfish from aquatic environments contaminated with mercury from certain industrial operations. The primary form of mercury in the fish and shellfish which were the principal factors in the cases of poisoning in Japan (Minamata disease) was methylmercury.

Recently, G. Birke, A. G. Johnek, L. Plantin, B. Sjöstronel, S. Skerfving, and T. Westermark [Arch. Environ. Health 25, 77 (1972)] have reported on a controlled study of the levels of mercury in the blood and hair of individuals consuming fish containing various concentrations of methylmercury. Two groups of subjects were studied. One group, referred to as the "normal" group, was made up of those consuming diets containing no, low, or moderate intakes of fish originating mainly from the ocean. Ocean fish are considered to contain "normal" levels (0.01 to 0.1 mg. per kilogram) of mercury, that is, mercury accumulated largely from natural sources rather than from that introduced into the aquatic environment by industrial or agricultural uses.

Total mercury and methylmercury in the blood and hair of subjects having a low, moderate, or high intake of fresh-water fish contaminated with methylmercury were

0.7 THE VALUE OF SELENIUM IN ANIMAL FEEDING

Cunha, T. J. (Dept. of Animal Science, University of Florida, Gainesville, Fla.)
Feedstuffs 45, No. 21, 48, 62 (May 21, 1973)

The role of selenium in animal feeding and nutrition has been discovered only in the last 5 to 10 years. This element was found to be essential in the diets for swine, chickens, turkeys, cattle, horses, sheep, and other animals. Many cases of selenium deficiency in livestock have occurred under practical feeding conditions. The author concluded that selenium supplemented feeds are needed for all classes of farm animals. The Food and Drug Administration proposed the use of the element for swine and poultry feed on April 28, 1973. Vitamin E and selenium are needed by animals; in some cases, vitamin E will substitute for selenium in varying degree, and selenium can be substituted for vitamin E. However, other cases will respond only to one or the other. Selenium has been found to reduce the amount of vitamin E required in an animal and to reduce the onset of symptoms of a deficiency. The sulfur containing amino acids (such as methionine) also protect against diseases associated with low intake of selenium and vitamin E. Vitamin E and selenium deficiencies are being encountered more frequently in the United States and other parts of the world. The author offered the following explanations for these deficiencies: selenium deficient areas are now being recognized throughout the world as more analyses of feed are conducted and more sensitive analytical methods are available for detecting very low levels of selenium; vitamin E-deficient diets are occurring that will increase the need for selenium under certain conditions; it is possible that certain strains or breeds of livestock require more selenium than

0.7 (0.4)(9.19)

also examined. Clinical evaluation of the state of health in exposed individuals was also investigated.

The results of the study by Birke et al. indicate that a predictable relationship does exist between exposure to methylmercury by ingestion of fish and blood mercury levels. A correlation between blood mercury levels and levels in hair also was seen.

What is not known with any certainty is the level of mercury in the blood and hair which corresponds to the onset of clinically detectable symptoms of mercury intoxication. [10 references]

Quoted in part; slightly modified to include the reference.

0.7

others; animals crossbred for increased growth and productivity also have increased nutrient needs including selenium; and analyses of feeds for selenium can be misleading. Many diets thought to be adequate may be deficient because the form of selenium may be low in availability. Vitamin E deficiencies are also appearing; the author suggests that the heating and other treatments given feeds is destroying the vitamin. The author described the effects of the deficiencies in swine, horses, chickens, turkeys, and ruminants. He suggests that the safest way to supply selenium is to add it to salt. Concentrations of selenium in muscle tissue of meat animals that might be toxic to humans have not been found, though the animals were exposed to toxic levels of dietary selenium.
[1 table]

SW

0.7 EFFECT OF FEEDING DIFFERENT PROTEIN LEVELS AND OF CHANGING PROTEIN LEVEL ON EGG PRODUCTION

Fernandez, Raul, Adel J. Salman, and James McGinnis (Dept. of Animal Sciences, Washington State University, Pullman, WA 99163)
Poultry Science 52, No. 1, 64-69 (Jan. 1973)

A diet containing 13% protein and supplemented with lysine and methionine was as effective as diets containing 15%, 17%, or 18% protein for supporting egg production and egg size of hens.
[9 tables, 17 references]

FTP

0.7 (9.19)

0.1 p.p.m. when the fish meal made up 17% of the diet. However, significant amounts of mercury were deposited in the test birds: 0.13 p.p.m. mercury in the feathers of the chickens fed the soybean diet; 0.44 p.p.m., in the feathers of the chickens fed the fish meal diet; and 0.33 p.p.m. in the feathers of the chickens fed the practical diet.

The chickens fed the diet containing 16.88 p.p.m. mercury succumbed to mercury toxicity by 17 days of age (the total mercury dose was 28.3 mg./kg. body weight). Within limits the levels of mercury in the tissues of the chickens were proportional to the dietary levels. After 7 weeks of exposure to the diets containing added mercury, the chicks retained an average of 63% of the mercury consumed. During a 21-day depletion period, the chickens excreted an average of 0.66% of the total body burden of mercury per day.

Rats fed 16.00 p.p.m. of mercury initially showed outward signs of toxicity at the sixth week of treatment. In general, the rats tolerated the highest level of dietary methyl mercuric chloride for a longer period of time than did the chicks. None of the rats fed the lower levels of mercury showed symptoms of toxicity.
[9 tables, 16 references]

FTP

0.7 MERCURY TOXICITY REDUCED BY SELENIUM

Anonymous
Nutrition Reviews 31, No. 1, 25-27 (Jan. 1973)

A methylmercury compound added to a tuna-corn-soya ration fed to Japanese quail was less toxic than an equivalent amount of the compound added to the basal corn-soya ration. Selenium present in the tuna is apparently the factor that reduces mercury toxicity, since it was also reduced or prevented by addition of selenium to the diets. These observations also suggest that mercury in tuna may be somewhat less dangerous for man than has been thought, and that total mercury in the diet or in the blood may not be a valid criteria, in the presence of modifying factors. Abstract and part of text quoted.

1.31 (1.0113) FACTORS AFFECTING THE ABUNDANCE OF FALL CHINOOK SALMON IN THE COLUMBIA RIVER

Van Hyning, Jack M. (University of Alaska, Fairbanks, Alaska)
Research Reports of the Fish Commission of Oregon 4, No. 1, 1-87 (Mar. 1973) Free. Obtainable from the Fish Commission of Oregon, Division of Management and Research, 17330 S.E. Evelyn St., Clackamas, OR 97015.

The fall run of chinook salmon in the Columbia River supported a fishery that maintained a production of 10 million pounds annually for many years. In 1949 a sharp decline began, leveled off, and stabilized through the 1950's at 2 to 3 million pounds annually. This report is an analysis of information on the chinook salmon covering the years 1938 to 1959 to determine the possible causes of the decline. Since 1959, further profound environmental changes have occurred in the Columbia and Snake Rivers which this report does not cover.

Highlights gathered from the analysis were: maturity and survival patterns changed at about 1950; a negative correlation was found between the ocean temperature during the first year at sea and survival; a large increase in ocean fishing coincided with the decline in the run; high exploitation in the ocean fisheries was found; the contribution of Columbia River chinook to the ocean fisheries was probably greatly underestimated; an inverse correlation between estimated ocean catch and fish entering the river was found for the postdecline period; the gill net fishery was destructive; optimum escapement between 90,000 and 100,000 adults was exceeded in most years; most of the early dams on the Columbia had no direct effect and the decline in production occurred when river conditions were stable;

1.013 (1.21)(6.10) THE ANCHOVY CRISIS

Idyll, C. P.
Scientific American 228, No. 6, 22-29 (June 1973)

The 1,475-mile Peruvian coastline is kept normally cool by the ocean current which can be as low as 10° C. (50° F.). This current is called the Peru Current and consists of four subcurrents. Two of these travel northward: The Coastal Current, flowing next to the shore; and the Oceanic Current, flowing farther out from the coast. Between them, on and near the surface, runs the Peru Countercurrent. Beneath the three currents runs the Peru Undercurrent. The countercurrent and the undercurrent flow southward. The Coastal Current runs deep and close to the shore; it is about 2,000 miles long, running from Valparaiso, Chile, to Chimbote, Peru. The anchovies live in the northern part of the Coastal Current. The Oceanic Current, longer than the Coastal, can be several hundred miles wide and 700 meters deep. The Oceanic Current is also called the Humboldt Current after the German naturalist who visited the area in 1803. The north flowing currents are generated by trade winds blowing from the south and southeast. As the resulting offshore drift moves the surface water northward, the cold subsurface upwelling water replaces it, bringing rich nutrients that have accumulated in the deeper layers. These nutrients sustain the vast phytoplankton pasture of the sea which provides the fodder for minute crustaceans. This food supply is the basis for the anchovy crop that has been harvested heavily in the Peruvian fishery. Because the egg of the anchovy has a negligible store of yolk, the larva, with limited swimming power, must locate food quickly. The abundance of phytoplankton provides the energy source for the larvae, and is thus significant in the abundance of anchovy.

1.89 TEMPORAL AND SPATIAL DISTRIBUTION OF ACANTHASTER PLANCI POPULATION EXPLOSIONS IN THE INDO-WEST PACIFIC REGION

Endean, Robert (Dept. of Zoology, University of Queensland, St. Lucia, Brisbane, Australia), and Richard H. Chesher (Marine Research Foundation, Key West, Fla.)
Biological Conservation 5, No. 2, 87-95 (Apr. 1973)

Since 1931 there have been conflicting reports regarding the population density of the starfish coral predator A. planci. The authors believe that unprecedented population explosions have occurred on the coral reefs since 1957. In table form they have listed reports of observations and counts of the starfish. From the Gulf of Aqaba, past Ceylon, through Malasia, on to the Great Barrier Reef, and off the coasts of the World War II island battle zones northward to Taiwan are the locations listed. Abundance of the starfish has been listed in the range from "none seen" through "large numbers" to "infestation." No report is dated earlier than 1964 in the table. The authors suggest that in some regions the area of affected reefs has progressively increased. The major infestations have occurred on accessible reefs near centers of human population, while remote reefs are free from infestations. The authors conclude that human involvement has some relation to the increase in the starfish population; however, they concede that areas near human population centers would be observed more frequently than remote areas would. [1 table, 25 references] SW

1.013 (1.21)(6.10)

Occurring at irregular intervals, a complicated series of phenomena, known as El Niño, can disturb this environmental system. This disturbance may be repeated annually for 2 or more years or may not recur for 10 years or longer. The disturbance usually begins about Christmas time and has been given the Spanish name for the Christ Child, El Niño. In El Niño conditions, the steady wind from the southeast shifts to the west, the temperature of the coastal water rises, and the salinity decreases. A slowing of the north flowing Coastal Current occurs, accompanied by a decline in the upwelling waters bearing nutrients for the phytoplankton. The scarcity of food combined with the increased temperature and decreased salinity of the water causes the anchovies to scatter. From the tight masses of fish that a purse seine could harvest 100 tons at a time, the anchovy aggregations decline to poor targets for fishermen.

The anchovy fishery made Peru the world's leading fish-producing nation. The anchovy industry began in 1957 and harvests increased since then until they were 10 million metric tons or more per year. The fish meal made from the Peruvian catch was sold worldwide to enrich livestock feeds; the fish oil went into foods, cosmetics, and industrial products. The exports brought Peru $340 million; and the industry was a major element in the economy. Beginning with a sudden decline in the early part of the year, the anchovy catch for the 1972 season declined to only 4.5 million tons. The latest El Niño is considered to be the most severe, but biologists are not blaming the anchovy decline on El Niño alone. They also believe that there are changes in the anchovy population which indicate that severe overfishing has occurred. A reduction in the number of spawners combined with physical changes in the environment may result in the inability of the anchovy population to recover to its original numbers when conditions return to normal. [4 photographs, 2 maps, 2 graphs]

SW

1.89 (1.01) CEPHALOPOD RESOURCES OF THE WORLD

Voss, Gilbert L. (School of Marine and Atmospheric Science, University of Miami, Coral Gables, FL 33124)

FAO Fisheries Circular No. 149, Food and Agriculture Organization of the United Nations, Rome, Italy (Apr. 1973), 75 pp. (Distribution restricted)

The groups of cephalopods considered in this report are: cuttlefish (Sepia, Sepiella) and bottle-tail squid (Rossia, Sepiola, and others); squid (oegopsids such as Ommastrephes and Illex and myopsids such as Loligo and Sepioteuthis); and octopus (Octopus, Cistopus, and Eledone). Information, on a worldwide basis, is provided on catch and landings, species of economic importance, biology of the species, methods of capture, and an estimate of the potential cephalopod resources of the world oceans.

The staff of FAO is preparing a comprehensive review of the world's marine resources as part of the Perspective Study of World Agricultural Development (formerly called the Indicative World Plan for Agricultural Development). As part of the study, the review "The Fish Resources of the Ocean," compiled and edited by J. A. Gulland, has already been published [Fishing News (Books) Ltd., England]. The present study is intended to supplement the overall review; it has been issued in a provisional version as an FAO Fisheries Circular to be issued later in another series.

[9 figures, 26 tables, 209 references]

FTP

0.8 (2.3)(9.19) WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS

Stuiber, David A. (University of Wisconsin, Food Science), and John T. Quigley (University of Wisconsin-Extension, Engineering)

Sea Grant Advisory Report No. 1, University of Wisconsin, Madison, Wis. (Nov. 1972), 17 pp. Price not given. Available from the Sea Grant Publications Office, 1225 W. Dayton St., Madison, WI 53706.

This paper describes briefly a two-stage combination anaerobic-aerobic waste water treatment system for a fish (fresh water) meal plant.

[5 figures, 3 tables, 4 references]

FTP

1.31 (1.0113)

temperatures of the river were not a serious factor; and river conditions at the time of migration were slightly related to return of adults.

Variables that appeared to relate to abundance were further analyzed. For the predecline period, ocean temperature and ocean troll fishing were significant. For postdecline years, troll effort had the most influence on total returns, with ocean temperature and escapement having lesser effects. Due to unique features in their life history, Columbia River fall chinook salmon are exposed to much more ocean fishing than other populations; thus, other runs did not show similar declines. The author concluded that increased ocean fishing was the main factor in the decline of the Columbia River fall chinook run. This conclusion was confirmed by correlation, by analogy, and by the process of elimination.

[21 figures, 14 tables, 99 references]

SW

2.1121 THE SMALLER FISHING BOAT. ONE BOAT -- FOUR TRAWLS

Noel, H. S. (World Fishing, Riverside House, Hough Street, London, SE 18 6LR, England)
World Fishing 22, No. 4, 34, 36 (Apr. 1973)

Gulf of Mexico shrimp trawlers are working four trawls together instead of the usual two. A boom on either side of the vessels supports two trawls each. The advantages of the multiple trawl are: better maneuverability, smaller doors (therefore less power), continuous fishing by alternate hauling, and an increased catch--by as much as 25%. A neutral door or sled towed between the two trawls acts as an inner door for each, and the outer edge of each trawl has a conventional otter door. [2 diagrams, 1 photograph] SW

2.118 FREEZING AT SEA ON WEST COAST TROLLERS. PART 1

Roach, Stewart W. (Technological Research Laboratory, Fisheries Research Board, Environment Canada)
Published by the Centre for Continuing Education, University of British Columbia, Vancouver 8, British Columbia, Canada (n.d.), 13 pp.

To maintain the best quality, fish should be 'quick' frozen. This term has been defined in Britain as follows: The whole fish is cooled through the range of 32° to 23° F. in less than 2 hr. and it is then kept in the freezer until the thickest part reaches 20° F. or lower. The factors which most affect rate of freezing are fish thickness, temperature of the cooling medium, and the efficiency of heat transfer between the fish and the cooling medium. For a given temperature difference between the fish and a cooling medium, the rate of heat transfer is lowest using air because it has a low capacity for picking up heat. Higher rates of heat transfer occur in contact freezing, and even more rapid cooling takes place when the fish is immersed in a freezing liquid such as brine.

There are three different methods in use by various British Columbia West Coast trollers for freezing fish at sea:

1. Shelf Freezing.--In this method the fish are frozen partly through contact with a cold shelf but mainly by circulation of cold air in the freezer section. The hold is refrigerated in a similar manner. A single refrigeration unit maintains the required temperatures for freezer section and hold.

2. Air Blast Freezing.--In this method a refrigerated blower unit is used to freeze the fish and refrigerate the hold. The fish are placed in racks in front of the blower unit for freezing.

2.15 (1.51) THE CONNECTIVE TISSUES OF FISH. VII. POST-MORTEM HYDRATION AND ICE CRYSTAL FORMATION IN MYOCOMMATA, AND THEIR INFLUENCE ON GAPING

Love, R. M., and J. Lavéty (Torry Research Station, Aberdeen, Scotland)
Journal of Food Technology 7, No. 4, 431-441 (Dec. 1972)

Other reports indicated that when chilled, gutted fish are frozen at different lengths of time after death, the amount of gaping that appears in the flesh after thawing and filleting increases in a characteristic way. Gaping was found least in iced fish that were frozen before the onset of rigor mortis. There is a rapid increase in gaping if rigor mortis sets in when the fish are in the process of being frozen. This increase in gaping is presumed to be due to the tension developed by the muscle as rigor mortis sets in. If the unfrozen fish are held for longer periods in melting ice, the rigor mortis that occurred in the muscle gradually ceases so that the body becomes more flexible. After freezing, thawing, and filleting of these fish following rigor mortis, less gaping would be expected than fish frozen at the height of rigor. Experiments on six species of fish showed that following resolution of rigor mortis the gaping continues to increase with time in ice before freezing. An investigation into the gaping that occurs under these conditions indicated that the water content of myocommata increased after the death of the fish. [Myocommata are membranous partitions between muscle segments. Abstractor's note]

Ice crystal formation upon subsequent freezing will be more disruptive under these conditions than when the myocommata are not so hydrated. Rigor mortis in

2.3 FISH SKINNING

Ammerman, G. R.; Mississippi State University Development Foundation, Inc. (pat.)
U.S. Patent 3,706,333
Food Technology 27, No. 6, 98 (June 1973)

Frozen dressed catfish are immersed in a hot caustic bath for 1-3 min., rinsed, and then placed in a neutralizing acid (acetic or citric) bath, and again rinsed to remove the skin. The fish are refrozen after deskinning. FTP

2.3 FORMING OF FISH MEAT

Langlands, I. H.; National Sea Products Ltd. (pat.)
Canadian Patent 919,495
Food Technology 27, No. 6, 98 (June 1973)

The equipment is used to produce predetermined-shape portions of fish. FTP

2.118

3. Air Blast With Semijacket.--This variation of airblast freezing discharges cold air through the fishhold; the air returns to the heat exchanger through ducts located between the insulation and the linings of the sides and floor of the hold.

The use of a single refrigeration unit for freezing fish in air is simple and relatively inexpensive, but the method has serious faults--one being insufficient refrigeration capacity. On many salmon trollers truck-type blower units are used which have a nominal rating of 1,500 lb. per day freezing capacity. If these systems are overloaded, some of the fish may be partially frozen and deteriorate in quality. Poor quality fish become tough and rancid; these undesirable characteristics occur more rapidly at temperatures just below 32° F. than at lower temperatures. Freezer methods which ensure rapid freezing to temperatures well below 32° F. will prevent this deterioration. The methods now in use on the trollers should be modified to obtain more efficient freezing. One of the most important changes would be the addition of forced air circulation. However, increase in the capacity of the refrigerator unit will be necessary. SW

2.114 POWER IS NOT EVERYTHING

Thew, C. (Kort Propulsion Co., Ltd., London, England)
Commercial Fishing 12, No. 4, 6-11 (Apr. 1973)

This article discusses ways and means of improving bollard pull without increasing engine horsepower. The horsepower output of an engine is not the only criterion to be considered in specifying the propulsion system components of a fishing boat. The overriding problem to be solved in selecting components for a propulsion system is how efficiently the engine power will be converted to useful thrust required to overcome trawl resistance. The use of a nozzle to house the propeller increases thrust and gives other advantages. The advantages of increased thrust can be used to: trawl larger gear, trawl at a faster rate, save fuel costs, reduce maintenance, increase carrying capacity by reducing fuel required, extend time at sea, and increase acceleration. The author gives a list of vessels that have been converted from open propeller to nozzle-type propulsion. Examples of increased bollard pull are as follows: the vessels Boston Argosy and Boston Provost had an initial pull of 5.15 tons; after conversion, the pull increased to 7.5 tons. The engine of 515 b.hp. was not altered.
[2 photographs, 4 diagrams, 6 tables, 6 references] SW

2.1121 DESIGN OF TRAWLS. PART 7

Buckingham, Harry
World Fishing 22, No. 4, 40, 42 (Apr. 1973)

The author closes his series of articles on nets and trawls with considerations to be applied in their design. Such details as horsepower of the towing vessel, the ground over which it will work, and the type of fish to be caught should be used in the trawl design. Examples of mesh calculations, information on dimensions to rig a taut net, and the type of selvage ropes to be used are given. In addition, the author describes the best multiple eye splices, toggles and footropes, and bobbins and floats to be used.
[2 diagrams] SW

2.15 (1.51)

muscle tissue causes shrinkage of the muscle cells with exudation of fluid. Radioactive tracer studies showed that this exudate plus water from melting ice in which the fish are packed are the sources of ice formed upon freezing the fish. By wrapping the fish before icing, the melt water is excluded from the fish muscle; fish frozen after this treatment were found to have less gaping.
[2 figures, 2 plates, 1 table, 17 references] SW

2.3 MACHINE FOR EXTRACTING MEAT FROM CRAB SECTIONS

Craig, Warren J. (Ellicott City, Md.) (pat.)
U.S. Patent 3,719,967 (Mar. 13, 1973)

The machine is used to extract the meat from the body sections of crab. FTP

3.11 (0.5) FUNCTION OF LIPOPHILIC ACIDS AS ANTIMICROBIAL FOOD ADDITIVES

Freese, Ernst, Chingju W. Sheu, and Enid Galliers (Laboratory of Molecular Biology, National Institute of Neurological Diseases and Stroke, National Institutes of Health, Bethesda, MD 20014)
Nature 241, No. 5388, 321-325 (Feb. 2, 1973)

Most food preservatives are lipophilic acids which inhibit the growth of unwanted microorganisms, usually without killing them. Although they are ingested in significant amounts, they do not seem to interfere with human organ function (as judged by toxicity tests). Up to now the inhibitory mechanism of these preservatives was not known, but in this report the authors indicate that the preservatives prevent microbial growth by inhibiting the transport of substrate molecules into cells.
[6 figures, 3 tables, 19 references] SW

3.63 (1.83) STUDIES ON THE PROCESSING OF ABALONE. V. DRIED ABALONE: TECHNIQUES AND CHARACTERISTICS OF DRYING

Doe, P. E. (Dept. of Mechanical Engineering, University of Tasmania), D. G. James, and Farley Young (CSIRO, Division of Food Research, Tasmanian Regional Laboratory, Hobart, Australia)
Food Technology in Australia 25, No. 4, 189, 191-192, 195 (Apr. 1973)

Whole, dried abalone of commercially acceptable quality were produced by hot air drying in a recirculating wind tunnel. From 6 to 18 abalone were supported across the working section of the wind tunnel on fiberglass gauze screens. The wind tunnel was open ended; the working section was 0.6 m. wide, 0.3 m. high, and 2 m. long. Studies indicated that abalone should be pretreated, before drying, by holding them overnight in 10% salt solution. After brining, they should be placed in water which is then brought to the boiling point over a 15-min. period and held in boiling water for 5 min. to ensure that they are adequately cooked. Rapid boiling is undesirable because it causes splits in the surface of the meat. Pretreated abalone were suitably dried in the wind tunnel with air temperatures in the 30° to 40° C. range at air velocities of 1.5 to 2.0 m. per second. Temperature, velocity, and humidity can be varied; however, if drying is to be performed slowly at low temperature, humidity should be such that water activity is low to prevent external bacterial damage. If drying is rapid at a high temperature, there is danger that the surface of the abalone will dry to a hard skin which will act as a barrier to prevent further drying in the interior of the meat; rapid drying can be prevented by increasing the humidity of the air.

3.2345 DIFFERENTIAL THERMAL ANALYSIS OF FROZEN FOOD SYSTEMS. II. MICRO-SCALE STUDIES ON EGG WHITE, COD AND CELERY

Parducci, L. G., and R. B. Duckworth (Research and Development Division, H. J. Heinz Co., Ltd., Hayes Park, Hayes, Middlesex, United Kingdom)
Journal of Food Technology 7, No. 4, 423-430 (Dec. 1972)

In the previous paper in the series [R. B. Duckworth, J. Fd. Technol. 6, 317 (1971)], a method was described for determining the quantity of unfreezable water in foods. In addition, the author suggested that such water is incapable of being converted to normal ice however lower the temperature is dropped. The use of lower temperatures revealed an irregular pattern of thermal behavior of each test material. In this paper (part II) the authors report that the influence of moisture content on irregular thermal behavior is related to the freezability of water in foods.

Samples of denatured egg white, powdered celery, and powdered cod were prepared and water content was determined. For differential thermal analysis (DTA), samples were quench cooled to -180° C. and set to warm at a rate of 20° C. per minute with a thermogram being recorded. Differential scanning calorimetry (DSC) was performed on samples in a similar manner.

The results indicated that heat denaturation of egg white reduced the proportion of water which is bound against freezing by about 14.5%. Egg white that had been subjected to aqueous extraction to remove water solubles exhibited a rise in the temperature at which the thawing peak appears for any specific level of hydration. Warming curves generated by DSC were similar to those generated by the DTA procedure. In the warming curve of samples containing relatively little water, the

4.14 SPERM WHALE OIL ANALYSIS BY GAS CHROMATOGRAPHY AND MASS SPECTROMETRY

Spencer, G. F.; and W. H. Tallent (Northern Regional Research Laboratory, ARS, U.S. Dept. of Agriculture, Peoria, IL 61604)
Journal of the American Oil Chemists' Society 50, No. 6, 202-206 (June 1973)

Following termination by law of U.S. trade in products from the sperm whale, research studies have been underway to develop substitutes for the valuable oil of this species. Winterized sperm whale oil was used in the lubricant industry; it was derived from a composite of head and blubber oils by a process that removed the more saturated components of both lipid fractions. This study was intended to obtain a detailed analysis of commercial winterized sperm whale oil before it disappeared from the market.

The wax esters with even carbon numbers of winterized sperm whale oil ranged from C_{24} to C_{42} and were present in quantities representing a normal distribution curve with C_{34} as the mean. Traces of odd chain lengths were also present. The levels of triglycerides also showed a normal distribution pattern and ranged from C_{42} to C_{58}; they included traces of odd chain species. Saturated and unsaturated, branched chain and odd chain constituents of alcohols and acids were found.
[1 figure, 5 tables, 27 references] FTP

3.2345

thawing peak did not appear. Other thermal irregulatities occurred in samples containing no freezable water; there was no thawing peak as expected, but there was an upward direction in the curves at progressively lower temperatures from samples containing progressively larger proportions of water. In the next paper, a fuller explanation of the meaning of irregular thermal behavior will be given. SW
[2 figures, 1 table, 19 references]

3.4 SMOKING PROCESS

Baker, H. O., J. E. Hoff; Peter Eckrich & Sons, Inc. (pat.)
Canadian Patent 920,872
Food Technology 27, No. 6, 104 (June 1973)

The process is designed to remove carcinogens from natural hardwood smoke. FTP

3.2493 (1.51) FROZEN STORAGE OF FISH. IX. FREEZING OF COD FILLETS

Tamoto, Kaoru, Takatoshi Hidesato, and Kenji Kida (Hokkaido Fish. Exp. Stn., Yoichi, Japan)
Chemical Abstracts 77, No. 25, 163161g (Dec. 18, 1972)

4.6 ANTIOXIDANTS

Hinkley, D. F.; Merck & Co., Inc. (pat.)
U.S. Patent 3,718,482
Food Technology 27, No. 6, 104 (June 1973)

Isoascorbic acid phosphates are used to enhance the antioxidant properties of foodstuffs. FTP

3.7 (1.22) CHANGE IN THE CONTENT OF AMINO ACIDS AND VOLATILE BASES IN FAT DURING PRODUCTION OF DRIP-DRIED AND SUN-DRIED PACIFIC HERRING

Bazilevich, V. I. (U.S.S.R.)
Chemical Abstracts 78, No. 7, 41753b (Feb. 19, 1973)

3.63 (1.83)

In the beginning of the drying process, the abalone dry at a constant rate; speed of drying is determined by the velocity and humidity of the air and by the shape of the meat. This phase of the drying is followed by the second phase in which the meat dries at a falling rate. The speed of drying can be increased by raising air temperature; however, it should not be increased above 40° C. or darkening of the meat will occur.
[4 figures, 4 references]

SW

3.9 (1.21) BIOCHEMICAL ASPECTS OF THE ENZYMIC RIPENING OF PRESERVED ANCHOVIES

Establier, Rafael, and Manuel Gutierrez (Inst. Invest. Pesq., Puerto Pesquero, Spain)
Chemical Abstracts 78, No. 9, 56627n (Mar. 5, 1973)

4.81 PROBLEMS DISCOURAGING USE OF FISH OIL IN AMERICAN-MANUFACTURED SHORTENING AND MARGARINE

Stansby, Maurice E. (Pioneer Research Unit, Northwest Fisheries Center, Seattle, WA 98112)
Journal of the American Oil Chemists' Society 50, No. 6, 220A, 222A, 224A-225A (June 1973)

In 1936, a peak of 40 million pounds of California sardine oil was used as a component of many margarines and shortenings of American manufacture. When commercial quantities of the California sardine (pilchard) no longer were available, fish oil dropped out of the market for edible use in the United States. During the interim years, various circumstances or problems discouraged use of fish oils in edible products in the United States. These problem areas involved satisfaction of sanitary requirements during production, possible flavor reversion, restrictive legal aspects, uniformity of quality, trace mineral content, public aversion to nonvegetable oil sources, and price. Satisfaction of legal and sanitation requirements probably could be achieved by costly improvements in manufacturing facilities and processes. The limiting factor in the use of fish oil for edible purposes in the United States, then, would seem to be its cost.
[11 references]
FTP

6.31 (9.16) EUCHEUMA FARMING FOR CARRAGEENANS

Doty, Maxwell S.
Sea Grant Advisory Report, UNIHI-SEAGRANT-AR-73-02, University of Hawaii, Honolulu, Hawaii (Apr. 1973), 21 pp. Price not given.

The different species of the seaweed genus Eucheuma produce one form or another of carrageenan. Carrageenan is a natural, complex carbohydrate product obtained by extracting seaweed with water. It is used as an emulsifier, stabilizer, and thickener in various foods such as ice cream, evaporated milk, puddings, and others. Most of the seaweed used in the production of carrageenan comes from Southeast Asia. This paper contains a description of the Philippine Eucheuma farming techniques and production areas.

The genus Eucheuma can be divided into two groups on the basis of the type of carrageenan produced; one group produces iota carrageenan (commercial name of "spinosum") and the other group produces kappa carrageenan ("cottonii"). About 3,000 to 4,000 tons of dry Eucheuma enter the world market, and most of it goes to the United States and some to the United Kingdom, France, and Denmark. The author indicates that the world price could be US$350 per ton if the product were clean, rewashed, dry, and monospecific (one species or the other). Some of the common carrageenan-containing species of Eucheuma used commercially are shown in the table that follows.

6.190 (4.9) THE METABOLIZABLE ENERGY VALUES AND DIGESTIBILITIES OF MENHADEN FISH MEAL, FISH SOLUBLES, AND FISH OILS

Cuppett, S. L., and J. H. Soares, Jr. (College Park Fishery Products Technology Laboratory, National Marine Fisheries Service, NOAA, College Park, MD 20740)
Poultry Science 51, No. 6, 2078-2083 (Nov. 1972)

Three energy balance experiments with chicks were used to determine the metabolizable energy (M.E.) content and the digestibility of the protein and the fat of fish meal, fish solubles, and fish oil. Ten menhaden fish meals, 10 menhaden fish solubles, and 6 menhaden fish oils were analyzed.

The menhaden fish meals had an average protein digestibility of 58.4% and a fat digestibility of 93.1%. The average M.E. value of the menhaden fish meals was 3.37 kcal./g. on a dry-matter basis (coefficient of variation was 5.6%), and 69.1% was metabolized.

Condensed fish (menhaden) solubles had an average protein digestibility of 57.1% and a fat digestibility of 88.7%. The M.E. value was 2.03 kcal./g. on an "as is" basis, and 70.4% of the energy in the fish solubles was metabolized. The coefficient of variation of the M.E. value was 10.8%. This relatively high variation is probably due to the low levels of solubles incorporated in the test diets.

The menhaden fish oils showed a fat digestibility of 90.6% and a M.E. value of 8.45 kcal./g. on the as is basis; the oils were 89.9% metabolized.
[9 tables, 17 references]
FTP

6.72 PURIFICATION OF A POTENT ANTITUMOR AGENT FROM A TAHITIAN SEA ANEMONE AND METHODS OF ADMINISTRATION STUDIES WITH EHRLICH ASCITES TUMOR IN MICE

Norton, T. R. (Dept. Pharmacol., Univ. Hawaii, Leahi Hosp., Honolulu, HI 96816), and M. Kashigawi
J. Pharm. Sci. 61, No. 11, 1814-1817 (1972)
Aquatic Sciences & Fisheries Abstracts 3, No. 3, Abstract No. 3Q2921M, 191 (Mar. 1973)

An antitumor agent, stoichactin, resulted from aqueous alcoholic extraction of the sea anemone identified most probably as Stoichactis kenti. The alcoholic extract was purified by dialysis and gel permeation chromatography. The purified agent was found to control and cure Ehrlich ascites tumor in mice. Low dosages and different methods of administering the agent were found to be effective.
SW

6.195 ABOMASAL AND BLOOD PLASMA NITROGEN CONSTITUENTS OF WETHERS FED CORN GLUTEN AND FISH MEAL SUPPLEMENTED SEMIPURIFIED DIETS

Amos, H. E., G. E. Mitchell, Jr., C. O. Little, and D. G. Ely (Univ. Kentucky, Lexington, Ky.)
Chemical Abstracts 78, No. 7, 42014y (Feb. 19, 1973)

6.73 CHEMICAL COMPOSITION OF DIFFERENT VARIETIES OF AMBERGRIS

Korzh, L. N., and L. I. Strigina (Tikhookean, Nauchno-Issled. Inst. Rybn. Khoz., Okeanol., Vladivostok, U.S.S.R.)
Chemical Abstracts 78, No. 6, 33795b (Feb. 12, 1973)

5.2 SOME MINOR VOLATILE COMPONENTS FROM THERMALLY DEGRADED THIAMINE

Dwivedi, Basant K., and Roy G. Arnold (Dept. of Food Science & Technology, University of Nebraska, Lincoln, NE 68503), and Leonard M. Libbey (Dept. of Food Science & Technology, Oregon State University, Corvallis, OR 97331)
Journal of Food Science 38, No. 3, 450-452 (Mar.-Apr. 1973)

Thiamine is used as one of the ingredients for simulating meat flavor in foods. The effects of thermal degradation products of thiamine on the flavor are of interest.

The purpose of this study was to identify the volatile compounds resulting from the heat degradation of thiamine. Solutions of thiamine (10 mg. thiamine hydrochloride/ml.) were adjusted to pH 5.0, 6.0, 7.0, and 8.4. Fifty ml. samples of each of the thiamine solutions were autoclaved in sealed bottles for 1 hr. at 121° C. The cooled samples were extracted with diethyl ether, and the ether extract was dried. The residue was redissolved in 0.5 ml. diethyl ether. Volatile components of the ether extracts were analyzed by gas-liquid chromatography in conjunction with mass spectrometry. The following components were identified:

Compounds previously reported: 2-methyl thiophene, 4,5-dihydro-2-methyl thiophene, and 4-methyl-5-(β-hydroxyethyl) thiazole.

Additional compounds tentatively identified: 2-methyl sulfide-5-methyl furan, 4,5-dimethyl thiazole, 2-methyl-3-oxy-tetrahydrothiophene, and 2-acetyl tetrahydrothiophene.

[2 figures, 1 table, 20 references] FTP

6.31 (9.16)

Sources of kappa carrageenan ("cottonii" types)	Sources of iota carrageenan ("spinosum" types)
E. cottonii	E. spinosum
(E. okamurae)	(E. muricatum)
E. striatum	(E. denticulatum)
(E. nudum)	E. isiforme
(E. edule)	(E. acanthocladum)
E. procrusteanum	E. uncinatum
E. speciosum	(E. johnstonii)

The growth characteristics of the two general types are described. Also, the commercial harvesting of the seaweed crop is discussed, as are some experiments on the farming of Eucheuma species in the Philippines. The author believes that farming of Eucheuma, properly managed, could produce three times the dollar rate of return of that of sugar [cane?] production.

[7 figures, 6 tables, 8 references] FTP

7.42 OPTIMUM PROCEDURE FOR THE DETERMINATION OF SELENIUM IN BIOLOGICAL SPECIMENS USING ^{77m}SE NEUTRON ACTIVATION

Blotcky, A. J., L. J. Arsenault, and E. P. Rack (Medical Research, Veterans Administration Hospital, Omaha, NE 68105)
Analytical Chemistry 45, No. 7, 1056-1060 (June 1973)

Since trace quantities of selenium are important in the physiology of living species, various analytical procedures have been developed to determine microquantities of the element in serum and tissue. Some of the more frequently used procedures involve neutron activation analysis of the longer lived radioisotopes of selenium including ^{75}Se and ^{81}Se. A potentially useful isotope, ^{77m}Se has not often been used because of its short half-life (17.6±0.15 sec.) which restricts post irradiation chemistry of the biological sample. An advantage of using ^{77m}Se is that a large number of samples can be analyzed for Se and then additionally analyzed for protein, nitrogen, or other components if a nondestructive technique is used.

The authors studied procedures for the rapid, quantitative determination of trace amounts of Se (less than 0.06 µg.) in serum and tissue using ^{77m}Se neutron activation. In the optimum procedure, using a low-power nuclear reactor, lyophilized tissue samples or dialyzed-lyophilized serum samples were irradiated for 20 sec., with a 20-sec. decay time, before exposure to radioassay. The radioassay assembly that was used in the procedure was the 5 mm. × 3 in. NaI (TI) detector system. The spectral analyses and data reduction procedure consisted of

7.47 PRECISE SHIPBOARD DETERMINATION OF DISSOLVED NITROGEN, OXYGEN, ARGON, AND TOTAL INORGANIC CARBON BY GAS CHROMATOGRAPHY

Weiss, R. F., and H. Craig (Scripps Institution of Oceanography, University of California at San Diego, La Jolla, CA 92037)
Deep-Sea Research and Oceanographic Abstracts 20, No. 4, 291-303 (Apr. 1973)

This paper describes a chromatographic system for the rapid and precise determination of dissolved gases in sea water aboard the research vessel at sea. Separate instruments are used for total inorganic carbon, and for nitrogen, oxygen, and argon analyses.
[5 figures, 25 references] FTP

7.50 (9.19) PESTICIDE RESIDUES

Thornburg, Wayne (Del Monte Corporation Research Center, Walnut Creek, CA 94598)
Analytical Chemistry, Annual Reviews 45, No. 5, 151R-167R (Apr. 1973)

This review period (Nov. 1970 to Nov. 1972) was one in which existing techniques were improved and new instrumentation was developed. A dictionary of pesticides with indexes, reviews, bibliographies, and other collections of pesticide information were published in the period. A pesticide data retrieval system was programmed for a computer. Techniques of gas chromatography (GC) continue to be the procedure that best meets the requirements for separation and measurement of pesticide residues. Improvements in analysis are expected with combinations of GC, mass spectrometry, and the assistance of the computer. Other innovations, modifications, and improvements in GC procedures were reviewed. General procedures for the analysis of chlorinated pesticides and their metabolic products were reviewed. Biological samples preserved in formaldehyde or phenol solutions for subsequent analysis were found to be in better condition for gas-liquid chromatography (GLC)--because of less interference--than samples preserved by other fixatives. Procedures for analysis of specific organochlorine pesticides were listed. Methods for the determination of organophosphorus pesticides were reviewed. Flame photometry was found to be the most satisfactory procedure. Reports of analytical procedures for many specific organophosphorus compounds were reviewed. Analysis for carbamate insecticides is sometimes made difficult because of their instability in GLC columns.

7.86 (0.5)(6.55) FACTORS INFLUENCING DETECTION OF SALMONELLAE IN RENDERED ANIMAL BY-PRODUCTS

Tompkin, R. B., and T. V. Kueper (Swift & Company, Research and Development Center, Oak Brook, IL 60521)
Applied Microbiology 25, No. 4, 485-487 (Apr. 1973)

There is no single method that will satisfactorily recover all Salmonella serotypes from all types of foods. Thus, detection of salmonellae in contaminated food and feed ingredients may depend upon many factors. In this study the researchers examined the influence of bacteriological media on and the relationship of total count to the isolation of salmonellae. Such information should provide a better understanding of the factors that influence the detection of salmonellae in naturally contaminated animal byproducts.

Of one hundred and eighty-three animal byproduct samples, previously determined to be positive for Salmonella, 139 were found positive in tetrathionate-Brilliant Green-iodine broth (TB) and 148, in selenite-cystine broth (SCB). The combination of SCB and Salmonella-Shigella agar plates (SS) gave 127 positive samples; the combination of SCB and Brilliant Green-sulfa agar (BGS) gave 92 positive samples. Of 405 samples, the rate of isolations of salmonellae increased from 12.7% to 70.6% as the total plate count increased from less than 10^4/g. to 10^7/g. There appears to be a linear relationship between detection of salmonellae and total plate counts of animal byproducts from 10^4 through 10^7 bacteria per gram. Samples having plate counts greater than 10^7/g. showed a decreasing rate of salmonellae

7.50 (9.19)

These difficulties can be avoided by forming multihalogenated acetate derivatives of the carbamate before subjecting it to GLC. Fluorometry, GC, thin-layer chromatography, and flame photometry were techniques used in analysis for carbamates. Herbicides are composed of various classes of compounds. The review articles were segregated according to class of compounds in the herbicides. Acidic herbicides were converted to nitro derivatives, after extraction and cleanup, and subjected to TLC. Further conversion to amines, diazotization, and coupling to another compound was necessary for visualization of the results. Analysis of herbicides containing triazines, nitrogen, phenoxyacetic acid, chlorophenoxy acid, and other compounds were reviewed. Analytical procedures for fungicides, agaricides (a type of fungicide), and pesticides too difficult to classify were listed to complete the review.
[411 references]

SW

7.42

eliminating the interference of isotopes with long half-lives by spectrum subtraction and correcting for their contributions in the region of the ^{77m}Se photopeak. Comparisons were made between results obtained using this procedure and results obtained from other techniques in the analysis of a National Bureau of Standards (NBS) bovine liver standard containing trace amounts of Se. The results of this suggested procedure compared well with the values given for the NBS standard. The authors suggest that the number of selenium analyses that can be run during a normal working day, including spectral analyses and data reduction, can approach 150 samples.
[5 figures, 2 tables, 14 references]

SW

7.86 (0.5)(6.55)

isolations. This decrease is probably due to overgrowth of salmonellae by other bacterial species during enrichment or plating, or both.

Animal byproducts are probably one of the few materials where a linear relationship exists between total counts and the incidence of salmonellae. The table that follows indicates the number of samples of animal byproducts required to detect salmonellae when the total plate count is known.

Total plate count per g. of animal byproduct	Probability of detecting salmonellae if only one animal byproduct sample is analyzed	Minimum number of samples needed to ensure detection of at least one positive sample
($\log_{10}$)		
4-5	0.40	10
5-6	0.47	8
6-7	0.55	6
7-8	0.63	5

[3 tables, 9 references]

FTP

7.8 BIOCHEMICAL AND MICROBIAL STUDIES ON SHRIMP: VOLATILE NITROGEN AND AMINO NITROGEN ANALYSIS

Cobb, Bryant F., III, Inelda Alaniz, and Charles A. Thompson, Jr. (Dept. of Animal Science, Texas A & M University, College Station, TX 77843)
Journal of Food Science 38, No. 3, 431-436 (Mar.-Apr. 1973)

The analysis of trimethylamine (TMA), dimethylamine (DMA), and total volatile nitrogen (TVN) in shrimp by the microdiffusion procedure [E. J. Conway, "Microdiffusion Analysis and Volumetric Error," MacMilliam Co., New York (1958), p. 199] was investigated, and certain differences in total volatile nitrogen (TVN) values obtained when shrimp were stored directly in ice as compared to those stored directly under refrigeration (in petri dishes) were examined. The interference of NH_3 and DMA in the analysis for TMA was reduced in the Conway microdiffusion procedure by using a saturated $Na_3PO_4 \cdot KOH$ solution as the releasing agent in place of K_2CO_3 solution. The authors present analytical procedures for (1) simultaneous analysis of DMA and TMA, (2) for obtaining TVN values reflective of NH_3 + TMA content of shrimp, (3) a rapid method for estimating TVN values in shrimp extracts, and (4) a rapid, simple colorimetric test for amino nitrogen (AN). The authors found that the ratios of TVN/AN appear to be more reflective of shrimp quality than do TVN values alone.
[5 figures, 3 tables, 18 references]

FTP

8.0 ELEMENTARY CHEMICAL COMPOSITION OF PINK SALMON SCALES

Klokov, V. K., and L. A. Frolenko (U.S.S.R.)
Chemical Abstracts 78, No. 5, 26727c (Feb. 5, 1973)

8.0 CHANGE IN FREE FATTY ACID COMPOSITION DURING AGING OF SALTED HERRING

Nasedkina, E. A., and T. V. Belova (U.S.S.R.)
Chemical Abstracts 78, No. 5, 28084q (Feb. 5, 1973)

8.8 (6.54) FLAVOR QUALITY OF VARIOUS GRAIN FLOURS AND OILSEED, MILK AND MARINE PROTEIN SUPPLEMENTS

Maga, J. A., and K. Lorenz (Dept. of Food Science and Nutrition, Colorado State University, Fort Collins, CO 80521)
Journal of Milk and Food Technology 36, No. 4, 232-236 (Apr. 1973)

Because of worldwide interest in supplementing major grains (rice, wheat, corn) with animal, vegetable, and marine protein sources, the researchers carried out a study to evaluate the flavor properties of the flour of these grains and of compatible supplements. Flavor evaluations were made by use of sensory panels, by gas-liquid chromatographic analysis of volatile components, and by estimation of the carbonyl content of the products. The objective was to demonstrate the flavor assets and the flavor limitations of the grains and supplements tested. Twelve commercial products were evaluated: whole wheat flour, low-heat nonfat dry milk, sodium caseinate, buttermilk solids, defatted soy flour, full-fat soy flour, isolated soy proteinate, rice flour, fish protein concentrate, peanut flour, and cottonseed flour. To provide background information on the various products, proximate composition of samples of each was determined. The odor intensity of the powders and of the powders suspended in freshly distilled and demineralized water was examined. Flavor intensity was determined on the samples in liquid suspension. Overall blandness was estimated by combining blandness values for the odor intensity and the flavor intensity of the samples in liquid suspension.

The odor of corn flour, full-fat soy flour, rice flour, and peanut flour was more bland in the liquid state than in the dry state. The nonfat dry milk, buttermilk solids, and rice flour appeared to be the most bland; fish protein concentrate

8.8 (7.85) SMOKED MULLET QUALITY: AN ASSESSMENT

Koburger, John A., and Von T. Mendenhall (Food Science Dept., University of Florida, Gainesville, FL 32601)
Journal of Milk and Food Technology 36, No. 4, 194-195 (Apr. 1973)

A survey was made of 12 processors of smoked mullet in Florida and 33 retail samples of the product were analyzed for proximate composition and bacteriological condition. Bacteriological analyses did not reveal any public health hazard but the authors suggest that certain aspects of the production of the product could be improved. Data are given on total count and counts of coliform, staphylococci, enterococci, and yeast and molds. Data on the proximate composition of smoked mullet from four different producers are shown in the table that follows.

Plant number	Proximate composition of smoked mullet sample			
	Moisture	Fat	Protein	Ash
	%	%	%	%
1	63.7	8.4	26.2	1.7
2	65.0	7.0	26.8	1.2
3	54.0	9.8	35.0	1.2
4	63.5	8.2	26.2	2.1
avg.	61.5	8.4	28.6	1.6
Fresh fish	73.5	7.0	18.0	0.5

[2 tables, 8 references] FTP

9.15 (9.16) BROKEN BACK SYNDROME TIED TO VITAMIN C DEFICIENCY

Anonymous
Fish Farming Industries 4, No. 3, 23 (June-July 1973)

Experiments were performed in May 1972 by R. P. Wilson, biochemist at Mississippi State University, on vitamin C deficiency in catfish. Catfish fed a commercial catfish ration with zero content of vitamin C were found to have deficiency symptoms 3 months after the beginning of the trial. The symptoms included a darkening of overall pigmentation and a vertical depigmented band behind the dorsal fin and an inability to swim freely. Gross pathology observed on opening the fish included hemorrhagic areas along the spinal column with overlapping, separated vertebrae behind the dorsal fin. No deformed fish were found in the control groups fed rations containing vitamin C. The livers and kidneys of the normal fish contained 10 times more vitamin C than those of the fish on the vitamin C-free diet.

Wilson recommended that the ration for cage culture of fish contain added vitamin C. He suggested broken back syndrome is not found in pond grown fish because the fish obtain sufficient vitamin C from aquatic organisms they find in the pond.

[1 photograph, 1 table] SW

8.8 DIFFERENCE TASTE THRESHOLDS FOR SODIUM CHLORIDE AMONG YOUNG ADULTS: AN INTERLABORATORY STUDY

Johansson, Birgit, and Birger Drake (Swedish Institute for Food Preservation Research, S-400 21 Göteborg, Sweden), Rose Marie Pangborn (Food Science & Technology, University of California, Davis, CA 95616), Nina Baryłko-Pikielna (Polish Meat Research Institute, Warsaw, Poland), and Egon Köster (Psychological Laboratory, Utrecht, Netherlands)
Journal of Food Science 38, No. 3, 524-527 (Mar.-Apr. 1973)

Individuals within the same laboratory often show large variability in sensory response to chemical stimuli. For example, E. Knowles and P. E. Johnson [Food Research 6, 207-216 (1941)] demonstrated that the absolute threshold for detection of sodium chloride ranged from 0.0058 to 0.468% within the same laboratory. This paper reports the results of a study of the degree to which differential sensitivity to a simple taste sensation differed among groups of persons and among laboratories in widely separated locations. Using a method of constant stimuli, different thresholds (expressed as jnd [just noticeable difference] values or Weber ratios) for the taste of sodium chloride at two standard concentrations were determined at four different laboratories in four different countries.

The total jnd values and (Weber ratios) for the four laboratories were: at the standard concentration of 0.30% sodium chloride--0.021% (0.070); 0.022% (0.073); 0.026% (0.087); 0.031% (0.103); and at the standard concentration of 0.80% sodium chloride--0.049% (0.062); 0.042% (0.053); 0.058% (0.073); 0.097% (0.121). At both of the standard sodium chloride concentrations, the jnd values for three of the laboratories were in fairly good agreement, but the values for the fourth laboratory were significantly higher. [4 figures, 2 tables, 14 references] FTP

9.15 (9.6) DISEASES OF FISH

Mawdesley-Thomas, L. E. (editor)
In Symposia of the Zoological Society of London, No. 30.
Published by Academic Press, London and New York (1972), 380 pp. Price $21.00.
James W. Warren (reviewer) (Bureau of Sport Fisheries and Wildlife, Genoa, WI 54632)
Transactions of the American Fisheries Society 102, No. 2, 502-503 (Apr. 1973)

The papers in the book concentrate on diseases of fish, causative agents, and the pathological changes that result. The reviewer suggests that a serious fault of the book is that it lacks an article on parasitic diseases of fish. In addition, the editor has given more than 30% of the book to his own field, tumors. The book also contains a paper on infectious dropsy in carp, which the reviewer praised as one of the best in the field of fish diseases. The etiology of ulcerative dermal necrosis was well reported in another article. In an article on bacterial diseases, the author erroneously assigned the agent of redmouth of trout to Aeromonas liquefaciens. The reviewer acquiesced with the editor in the conclusion that fish pathology must develop as a scientific entity of its own. SW

8.8 FLAVOR THRESHOLDS FOR FATTY ACIDS IN BUFFERED SOLUTIONS

Baldwin, Ruth E., and Marion R. Cloninger (Dept. of Food Science & Nutrition, University of Missouri-Columbia, Columbia, MO 65201), and Robert C. Lindsay (Dept. of Food Science, University of Wisconsin-Madison, Madison, WI 53706)
Journal of Food Science 38, No. 3, 528-530 (Mar.-Apr. 1973)

Ethanoic, butanoic, hexanoic, octanoic, and decanoic (fatty) acids help contribute to the characteristic flavor of dairy products and other foods. The levels at which the flavor of these fatty acids are detectable (recognition threshold) in citrate-phosphate buffer systems at pH of 3.2, 4.5, and 6.5 were determined. The citrate-phosphate buffer was used because this system does not introduce ions foreign to food products. Paired comparison tests were used; samples consisted of a buffer solution and a buffer solution containing fatty acid. In the preliminary tests, the researchers found that the judges tended to rely on aroma for detection of fatty acid at low pH levels, and upon taste or flavor at higher pH levels. Therefore, for butanoic acid and decanoic acid, they determined taste and aroma thresholds as well as flavor threshold. The judges evaluated taste while using nose clips; they evaluated aroma by sniffing the sample; and they judged flavor by checking for flavor in the mouth (without the use of nose clips).

Increased levels of the various fatty acids were required for recognition of their flavor as the pH of the buffer carrier increased from 3.2 to 4.5 to 6.0. Thus, the flavor these fatty acids contribute to a food might be expected to increase as the pH of the food decreases. For the butanoic and decanoic acids, aroma and flavor thresholds were more similar than were taste and flavor thresholds; therefore, aroma apparently contributed more than did taste to the flavor of these acids. [1 figure, 2 tables, 15 references] FTP

8.8 (6.54)

and peanut flour, the least bland. The total GLC peak areas were the greatest for isolated soy proteinate and smallest for sodium caseinate. Total carbonyl content ranged from 4 p.p.m. (for buttermilk solids) to 230 p.p.m. (for full-fat soy flour); carbonyl content of fish protein concentrate was around 15 p.p.m. Proximate composition data are shown in the following table:

Product	Proximate composition				
	Moisture	Protein	Fat	Ash	Fiber
	%	%	%	%	%
Whole wheat flour	11.8	13.1	2.1	1.6	2.2
Non-fat dry milk	3.0	35.9	0.8	8.0	0.0
Sodium caseinate	3.6	90.3	1.0	4.1	0.0
Buttermilk solids	2.8	34.3	5.3	7.6	0.0
Corn flour	12.1	7.7	2.7	0.7	0.7
Defatted soy flour	6.8	51.9	0.8	7.1	2.3
Full-fat soy flour	8.2	38.8	19.6	4.7	4.0
Isolated soy proteinate	4.5	92.5	0.1	4.0	0.2
Rice flour	11.9	6.6	0.5	0.5	0.4
Fish protein concentrate	2.2	78.1	0.4	19.1	0.0
Peanut flour	7.2	48.1	9.4	4.0	2.9
Cottonseed flour	6.2	48.0	6.5	6.1	2.1

[6 figures, 1 table, 18 references] FTP

9.14 (1.92) EFFECTS OF THREE DIETARY CALCIUM AND PHOSPHORUS LEVELS ON THE GROWTH AND MINERAL RETENTION OF CHANNEL CATFISH FINGERLINGS (ICTALURUS PUNCTATUS)

Dove, George Robert (Kansas State Univ., Manhattan, Kans.)
Chemical Abstracts 78, No. 7, 41912c (Feb. 19, 1973)

9.14 (9.13)(1.37) EFFECT OF HIGH-CAROTENE SUPPLEMENTARY VEGETABLE FEED ON THE VITAMIN A CONTENT OF RAINBOW TROUT FRY (SALMO GAIRDNERI)

Steffens, W., and H. Karst (Inst. Binnenfisch. Berlin-Friedrichshagen, Berlin/Friedrichshagen, East Germany)
Chemical Abstracts 78, No. 9, 56769k (Mar. 5, 1973)

9.16 (1.69) THE STORAGE OF PLAICE (PLEURONECTES PLATESSA) SPERM AT LOW TEMPERATURES

Pullin, R. S. V. (Marine Biological Station, Port Erin, Isle of Man, United Kingdom)
Aquaculture 1, No. 3, 279-283 (Dec. 1972)

Sperm storage is potentially useful in aquaculture because the male component of the breeding stock can be held at low cost, and it allows for selection and retention of good strains of fish. In addition, transportation of deep frozen sperm containers is cheaper, easier, and involves less risk of spreading infectious diseases than shipment of live male fish. There is a large research effort underway throughout the British Isles to develop techniques for the cultivation of marine flatfish, and plaice is the species chosen for most of the experiments. One of the experiments was a preliminary investigation into the low temperature storage of marine flatfish sperm.

Plaice sperm, diluted in sodium chloride solution containing penicillin and sealed in 1 ml. ampoules, were deep frozen at -79° C. and -196° C. After 315 days' storage at -196° C. samples from three different fish were thawed and a small amount from each was examined for motility. The remainder of each ampoule was mixed with about 500 freshly taken eggs. The results of the examination showed high motility; in addition, the appearance of the frozen sperm was identical to fresh sperm. Sperm frozen at -196° C. successfully fertilized 50% of the eggs, and cleavage of the developing eggs appeared normal after 48 hr. Fresh sperm used as a control fertilized 85% of the eggs. Sperm stored at -79° C. showed little or no motility on

9.16 THE COMMERCIAL FEASIBILITY OF REARING POMPANO, TRACHINOTUS CAROLINUS (LINNAEUS), IN CAGES

Smith, Theodore Isaac Jogues
Sea Grant Technical Bulletin No. 26, Information Services, University of Miami, Sea Grant Institutional Program, 10 Rickenbacker Causeway, Miami, FL 33149 (1973), ix + 66 pp. Price $3.00.

Attempts at culture of the Florida pompano have achieved limited success. Pompano appear to be suitable for aquaculture because they grow rapidly in captivity and they can endure a wide range of environmental conditions. This species of fish is in great demand for food and it commands the highest retail price of all the fishes landed in the southern United States. Because of these considerations, the researcher attempted to assess the suitability of rearing pompano in cages and to determine the growth and mortality of the fish at stocking densities that would be practical under commercial-scale operations.

The pompano were reared in 1 $m.^3$ aluminum cages (6.4-mm. mesh) at five stocking densities of 100, 250, 400, 650, and 900 fish per cubic meter. Marketable-size fish (1 lb. or 454 g.) were obtained within 47-51 weeks (starting with a 7 g. fish). The growth rate and yield per fish stocked were significantly higher at the lower stocking densities. The highest total yield of 113 and 116 kg./$m.^3$ were obtained at the highest stocking density. The author believes that the cages were used below their maximum carrying capacity and that greater yields may be possible. The mean mortality was 16% at stocking density of 100 and about 24% (the highest)

9.17 (1.93) THE SURVIVAL SITUATION OF THE HAWKSBILL SEA-TURTLE (ERETMOCHELYS IMBRICATA) IN MADAGASCAR

Hughes, George R. (Oceanographic Research Institute, P.O. Box 736, Durban, Natal, South Africa)
Biological Conservation 5, No. 2, 114-118 (Apr. 1973)

Although the green turtle is more abundant than the hawksbill sea turtle, the latter made Madagascar famous as a source of tortoiseshell. Export of this product was maintained (4,000 kg. annually) through the 19th and to the turn of the 20th centuries. After World War I, a decline set in, and presently, the trade is very small. The drop in exports occurred before the advent of plastic substitutions; however, the demand for tortoiseshell continued to remain high. The cause of the decline is due to overexploitation. In spite of the numbers of the sea turtles taken, the author reports that there are still substantial numbers in the coastal waters of Madagascar, particularly the northern third of the island which constitutes the major nesting ground. Although not as great as in the past, the current value of hawksbill products justifies rigorous enforcement of existing laws regulating the catch of this turtle. The meat of all other sea turtles is used for food; in contrast, the meat of the hawksbill turtle is not edible and may have toxic properties. It is usually discarded. The author concluded that the present population of hawksbill, with protection of nesting females, could be restored to a safer level; this change could result in an increased source of revenue, and renew one of the great concentrations of this sea turtle.
[5 figures, 2 tables, 5 references] .SW

9.16

at stocking density of 650; overall mortality was 21% (half of this amount was attributed to an inadequate diet).

The cost of feed to produce 1 kg. of pompano was $1.70 at stocking density of 100 and $2.17 at stocking density of 900. However, the greatest profit ($160 per cage) was achieved at the highest stocking density.

Some monogenetic trematodes and some body abrasions on the fish were noted, but no significant disease or parasitic infestation occurred. The biggest problems involved heavy fouling of the cages and development of poor quality water.

Some of the pompano were released after they had been conditioned to the cages. These released fish remained and fed in the area in which they were conditioned, suggesting the possibility of culturing this species without the use of confining structures.

[6 figures, 13 tables, 64 references] FTP

9.16 INTENSIVE WARMWATER FISH CULTURE
(1.92)

Allen, Kenneth O. (Fish Farming Experimental Station, Stuttgart, Ark.)
Fish Farming Industries 4, No. 3, 24-26 (June-July 1973)

The culture of warmwater fishes--such as catfish--in raceways, tanks, and cages (in contrast to pond culture) is being investigated with promising results. There are several species of warmwater fish besides channel catfish that may be suitable for this type of culture. The Israeli carp is one possibility, because it tolerates crowded conditions and can be easily marketed in certain areas. Other fish that have been investigated with promising results are striped bass and large-mouth bass. White crappie, white catfish, and black bullheads have been found slow in growth compared to channel catfish.

Most warmwater fishes grow best at temperatures in the low or mid-80's. The quality of the water should be maintained by changing the water once for every 1 to 1½ hr. the fish are in the raceways and tanks. In addition, the water should originate from a spring or well and be free of disease organisms. Total alkalinity should be above 40 p.p.m.; excessive gases or minerals such as nitrogen or iron should not be present. Disposition of water after it leaves culture facilities may be either release into public waters after lawful standards have been satisfied or reuse after treatment to reduce the number of disease organisms. Effluent water from catfish raceways has been used to grow plankton and detritus feeders such as tilapia, buffalo fish, and shellfish with good results.

The disadvantages of raceway and tank culture are as follows: compared to pond culture, a more costly, nutritionally complete feed is required; a higher incidence of disease due to crowding occurs; and failure of water supply equipment can cause costly fish losses quickly. [4 photographs] SW

9.16 THE INFLUENCE OF DIETARY PROTEIN AND ENERGY LEVELS
(1.85) ON GROWTH AND SURVIVAL OF PENAEID SHRIMP

Andrews, James W., Lowell V. Sick, and Garry J. Baptist (Skidaway Institute of Oceanography, P.O. Box 13687, Savannah, GA 31406)
Aquaculture 1, No. 4, 341-347 (Mar. 1973)

Rearing shrimp under aquaculture conditions requires a diet which will promote optimal growth. The specific nutrient requirements of shrimp, particularly the utilization of protein, carbohydrates, and lipids, are not yet established. To help provide some information, a study was conducted to generate preliminary data on the growth response of shrimp to various levels of these three basic dietary substances.

Two feeding experiments were conducted. In the first, a series of 14 semi-purified formulations were fed to triplicate groups of 10 juvenile shrimp housed in 400-l. round culture tanks. The diets contained 28% to 52% protein (mostly fish meal), 0% to 40% glucose, and 0% to 20% supplemental lipid. All formulations, including those in the second experiment, contained 5% collagen as a binder. The formulations were then extruded and pelleted. In the second experiment, 12 diets were fed for 8 weeks to the same number of shrimp per diet as in the first experiment. These diets contained 14% to 32% protein, 0% to 30% starch, and 0% to 10% supplemental lipid.

Results from experiment No. 1 indicated that 28% protein in the formulation was the best level without supplemental glucose or lipids. Results from the second experiment indicated that shrimp fed diets containing 14% or 23% protein and 30% supplemental starch had higher growth rates than shrimp on diets without supplemental starch. Other results indicated that shrimp fed diets containing lipid supplement had lower survival rates than those on diets without lipid supplement.

(4 tables, 11 references] SW

9.16 (1.69)

thawing, and showed no evidence of capability to fertilize eggs. This result surprised the author because cod sperm was previously reported to be viable at this temperature. Since -79° C. temperatures are generally more available through use of solid carbon dioxide, more investigations into storage at this temperature should be undertaken.

[1 table, 6 references] SW

9.16 APPARATUS FOR GROWING CRUSTACEANS

Day, John J., and Paul S. Hirschman (Fort Lauderdale, Fla.) (pat.)
U.S. Patent 3,724,423 (Apr. 3, 1973)

The apparatus is used for growing certain crustaceans (shrimp) during their postlarval period. It contains a series of interconnecting tanks. Filtered water, maintained at the desired temperature, is continually recirculated through each tank. FTP

9.19 SUMMARY OF RECENT STUDIES IN JAPAN ON METHYL MERCURY POISONING

Kojima, Kohei (Environmental Sanitation Bureau, Ministry of Health and Welfare, Tokyo, Japan), and Masahiko Fujita
Toxicology 1, No. 1, 43-62 (Mar. 1973) (Published by Elsevier/North-Holland, Amsterdam, Netherlands)

The summary is divided into six sections. The first deals with methyl mercury in the environment. Reports on the presence of mercury pollution in the Minamata District in Japan indicated that the level of mercury in local fish and shellfish fell markedly. In humans, the level is gradually falling. Other reports cover methyl mercury and inorganic mercury in fish, birds, and animals, river sediments, and effluents from the chlorine industry. The second section consists of summaries of reports on the methylation of inorganic mercury and the decomposition of organic mercury. Methylation could be accomplished nonenzymatically, and by biological agents such as bacteria and yellowfin tuna liver homogenates; ultraviolet irradiation aided the conversion. Organic mercury compounds were reported to be removed from industrial wastewater by treatment with aluminum powder, exchange resin, and sodium sulfide. Microorganisms and plant roots were found to decompose organic mercurials. The third section covers the pathology followup of patients in the Minamata and Niigata Districts (where mass mercury poisoning occurred) of Japan. The fourth section is a review of reports on metabolism of mercury in animals. In rabbit blood studies, mercury was found to concentrate in the erythrocytes. Cats fed methyl mercury sulfate developed symptoms found in cats fed fish from Minamata Bay. Rats poisoned with mercury were found to have

9.19 (1.37) TOXICITY OF METHYL MERCURY FOR STEELHEAD TROUT SPERM

McIntyre, J. D. (Oregon Cooperative Fishery Unit, Oregon State University, Corvallis, OR 97331)
Bulletin of Environmental Contamination and Toxicology 9, No. 2, 98-99 (Feb. 1973)

Tests were performed to determine the concentrations of methyl mercuric chloride that would reduce the viability of sperm of steelhead trout. The sperm was obtained from five fish, pooled, and inoculated into test tubes containing a range of methyl mercuric chloride concentrations in 0.85% sodium chloride solution maintained at 11° C. The concentrations of mercury ranged from 1 g. per liter to 10 mg. per liter. After 30 min., each sperm-containing solution was combined with 100 steelhead eggs (from a single female). After 1 min., each group of eggs was washed and placed in an incubator tray. The percentage of fertilization was determined 16 days later. The percentage of eggs that were not fertilized indicated that concentrations of mercury of 1.0 p.p.m. or greater reduced sperm viability.
[1 table, 2 references] SW

9.19 FATE OF DIELDRIN IN SELECTED SPECIES OF MARINE ALGAE

Rice, Clifford P., and Harish C. Sikka (Syracuse University Research Corporation, Syracuse, NY 13210)
Bulletin of Environmental Contamination and Toxicology 9, No. 2, 116-123 (Feb. 1973)

Marine phytoplankton are primary producers and are in the first level of build-up of persistent pesticides such as dieldrin. These organisms react to the pesticide in varying degrees; dieldrin concentrations up to 1,000 p.p.b. had no effect on photosynthesis in certain species, but the photosynthesis of other species was affected by as little as 1 p.p.b. The dieldrin accumulated by the algae may be metabolized into more persistent and more toxic substances than the original compound. The accumulation and metabolism of dieldrin was investigated in organisms representing five algal divisions--Bacillariophyta, Pyrrophyta, Xanthophyta, Chrysophyta, and Euglenophyta. Pure cultures of algae mixed with ^{14}C-dieldrin in acetone were incubated on a rotary shaker. After exposure to dieldrin the cells were centrifuged and washed and resuspended in scintillation fluid for counting. The uptake of dieldrin by the organisms was then determined.

The metabolism of ^{14}C-dieldrin was investigated also. Pure cultures of algae were incubated with the radioactive pesticide for 2 weeks. The cells were then centrifuged and extracted with acetone. The extracts were analyzed by gas-liquid and thin-layer chromatography.

The results indicate that when cells were exposed to various concentrations of dieldrin, its uptake by the cells increased as the concentration increased up to 1,000 p.p.b. In suspensions containing cell densities ranging from 0.1 to 1.3

9.19 (0.5) DEGRADATION OF METHYLMERCURY BY BACTERIA ISOLATED FROM ENVIRONMENTAL SAMPLES

Spangler, William J., James L. Spigarelli, Joseph M. Rose, Reid S. Flippin, and Hope H. Miller (Midwest Research Institute, Kansas City, MO 64110)
Applied Microbiology 25, No. 4, 488-493 (Apr. 1973)

This study showed that several bacterial species, capable of degrading methylmercury, are easily isolated from environmental samples and that they could be responsible for rapid turnover of methylmercury formed in sediments. The samples consisted of fish and sediment from the delta area of Lake St. Clair, Mich. Two hundred and seven bacterial cultures, isolated from these environmental samples, were screened for their ability to degrade methylmercury. Thirty of the cultures were positive for aerobic demethylation of methylmercury without previous adaptation to the compound. Of these 30 isolates, 22 were facultative anaerobes, and 21 of them were capable of anaerobic demethylation. Two of the positive isolates were gram-positive cocci, two were gram-positive rods, and the rest were gram-negative rods with characteristics typical of Pseudomonas. Methylmercury degradation was complete in most cases; however, material balances indicated that some of the inorganic mercury formed was not volatilized (presumably it is bound to the cells). All the positive cultures were tolerant to at least 0.5 µg. of methylmercury per milliliter; the extent of volatilization of mercury increased with the level of mercury up to this threshold value.
[1 figure, 5 tables, 7 references] FTP

9.19

mg. per 10 ml. with a constant dieldrin concentration of 1.7 p.p.b., the uptake of the dieldrin increased as the cell density increased. The various species (at a cell density of 0.2 mg. per ml.) differed in their ability to remove dieldrin (at a concentration of 1.7 p.p.b.) from the medium; Skeletonema costatum of the Bacillariophyta removed 42.0%, and Amphidinium carteri of the Pyrrophyta removed only 2.3%. Analysis of cell extracts indicated that dieldrin remained unchanged in the algal cells after 2 weeks of incubation and was not metabolized.
[3 figures, 1 table, 9 references]

SW

9.19 DEVELOPMENT AND GROWTH OF EGGS AND LARVAE MYTILUS EDULIS EXPOSED TO LINEAR DODECYL BENZENESULFONATE, LAS

Granmo, A. (Kristinebergs Zool. Stn., Fiskebackskil, Sweden)
Chemical Abstracts 78, No. 9, 53569j (Mar. 5, 1973)

9.19 STRUCTURE AND FUNCTIONING OF ESTUARINE ECOSYSTEMS
(0.8) EXPOSED TO TREATED SEWAGE WASTES III. 1971-1972

Kuenzler, Edward J., Alphonse F. Chestnut, and Charles M. Weiss (Dept. of Environmental Sciences and Engineering and the Institute of Marine Sciences, University of North Carolina)
Sea Grant Publication UNC-SG-73-10, Sea Grant Program, School of Public Health, University of North Carolina, Chapel Hill, NC 27514 (Mar. 1973), 223 pp.

This report, the fifth in a series, deals with investigations of the ecological systems which develop in small brackish water ponds enriched with domestic sewage (which had received secondary treatment). In this study, three ponds (controls) received a constant flow of water from Bogue Sound (sea water), which was diluted with tap water to reduce its salinity. Three waste ponds received an intermittent flow of water from Calico Creek (fresh water) mixed with some of the effluent from the Morehead City, N.C., sewage treatment plant. Observations were made to obtain an understanding of the ponds and of their functioning as ecological systems. The earlier reports presented details on populations of phytoplankton, zooplankton, fishes, crustaceans, molluscs, and foraminifera, and information on carbon budget, the phosphorus kinetics, the nitrogen metabolism, primary productivity, and bacterial heterotrophy in the ponds. Other articles in the reports dealt with populations and processes of nearby estuaries and salt marshes; growth of Ulva and Spartina; hydrography and phytoplankton of Calico Creek; microarthropods and insects; fiddler crabs; and salt marsh snails.

This fifth, and final report of the project contains 18 articles dealing with the research work carried out from July 1971 to Dec. 1972. It contains information on phytoplankton, zooplankton, bacteria, nutrients, fishes, etc.; and some discussion of aquaculture potential.

FTP

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high levels in peripheral nerves. The fifth section is a survey of reports on pathology and toxicology in animals. The cellular changes in the endoplasmic reticulum, cerebellum, liver, kidney, and spleen were described. The sixth section deals with mercury levels in the human body. The data showed that an estimated 24 mg. of mercury was present in a Japanese adult of 50 kg. One report indicated that the mercury content of a urinary calculus taken at autopsy was 1,000 times that of normal human urine.
[83 references]

SW

9.19 MERCURY DISTRIBUTION LEVELS OBSERVED IN VARIOUS ECOSYSTEMS AS DETERMINED NEUTRON ACTIVATION ANALYSIS

De Goey, J. J. M., J. P. W. Houtman, P. S. Tjioe, and J. H. Koeman (Interuniv. React. Inst., Delft, Netherlands)
Chemical Abstracts 78, No. 9, 53536w (Mar. 5, 1973)

9.19 GAS-LIQUID CHROMATOGRAPHIC SEPARATION OF SULFUR FROM CHLORINATED PESTICIDE RESIDUES IN WASTEWATER SAMPLES

Baird, R. B., L. G. Carmona, and C. L. Kuo (County Sanitation Districts of Los Angeles County, Whittier, CA 90601)
Bulletin of Environmental Contamination and Toxicology 9, No. 2, 108-115 (Feb. 1973)

Colloidal sulfur and organosulfur compounds resulting from bacterial activity are reported to be found in industrial discharges, human and animal wastes, and mineral sources. Analyses for chlorinated pesticides such as two forms of DDE, aldrin, lindane, and heptachlor by gas-liquid chromatography have been reported to be hampered by the presence of sulfur when electron capture detectors were used. Sample cleanup using acetonitrile-hexane or hexane-ether partitioning and adsorption chromatography was also found to be inadequate for separation of large amounts of sulfur. To overcome the problem of sulfur interference and not use time-consuming alternatives, the authors devised a mixed column packing which provides the necessary resolution for analysis of chlorinated pesticides. The column packing consisted of a mixture of 4.4% (w/w) OV-17, 4.7% QF-1, and 1.0% DC-200, on 80/100 mesh Gas-Chrom Q solid support. Each liquid phase was coated separately on a portion of the support, and the coated portions were combined before packing into 6 ft. by 1/8 in. i.d. glass columns. After packing, the columns were conditioned at 250° C. for 8 to 10 hr. before use. The gas chromatographs were fitted with electron capture detectors, and the carrier gas was 5% methane/argon at a flow rate of 40 ml. per minute. The detector, oven, and injection port temperatures were 250°, 220°, and 235° C., respectively. The results of routine use of the mixed column showed that sulfur interference was eliminated in the analysis of sulfur-containing wastewaters for chlorinated pesticides.
[4 figures, 8 references]

SW

9.19 PETROLEUM HYDROCARBONS IN NARRAGANSETT BAY.
I. SURVEY OF HYDROCARBONS IN SEDIMENTS AND CLAMS
(MERCENARIA MERCENARIA)

Farrington, John W., (Chemistry Dept., Woods Hole Oceanographic Institution, Woods Hole, MA 02543, U.S.A.), and James G. Quinn (Graduate School of Oceanography, University of Rhode Island, Kingston, RI 02881, U.S.A.)
Estuarine and Coastal Marine Science 1, 71-79 (1973) (Henry Ling Ltd., Dorset Press, Dorchester, Dorset, United Kingdom)

As part of a larger research study of the biogeochemistry of lipids in recent estuarine sediments and benthos, the authors analyzed the hydrocarbons in the surface sediments (0 to 8 cm.) and clams from three stations in Narrangansett Bay, R.I. The sediment and the clams contained a complex mixture of hydrocarbons; these hydrocarbons were not present in clams from Charlestown Pond, a relatively unpolluted coastal pond. These hydrocarbons are also present in crude oils and fuel oils, and the contamination of the sediment and clams appears to come from the discharge of petroleum hydrocarbons in sewage effluents and from small oil spills. The authors suggest that efforts to reduce the occurrence of large accidental oil spills should also be accompanied by efforts to reduce the constant dribbling of oil into the marine environment by sewage effluents, storm sewers, industrial effluents, tanker-shoreline storage area transfers, and small craft operators. The data in this report should help describe the present status of the Narragansett Bay estuary and are useful for assessing its recovery or its future deterioration by petroleum contamination.
[2 figures, 1 table, 31 references]

FTP

9.19 THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT:
IMPLICATIONS FOR WATER QUALITY MANAGEMENT

Prepared by the staff of the Southern California Coastal Water Research Project
SCCWRP TR104, Southern California Coastal Water Research Project, El Segundo, Calif. (Mar. 1973), 531 pp. Price $15.00. (Available from the SCCWRP, 1500 East Imperial Highway, El Segundo, CA 90245)

A 3-year study of the ecology of southern California coastal waters indicated that some of the concern expressed in recent years over the possible harmful effects of municipal wastewater discharges is exaggerated. The study, which consisted of literature review, laboratory and field programs, and predictive modeling, involved characterization of the general physical, chemical, and biological conditions in the nearshore waters as well as detailed examination of conditions near major wastewater outfalls. Sources of various substances (particulate materials, oil and grease, plant nutrients, trace metals, chlorinated hydrocarbons, etc.) were identified, and input magnitudes were estimated; the study revealed little or no justification for altering present municipal wastewater treatment or discharge practices with regard to the constituents examined, with the exception of floatable materials, highly toxic metals, and chlorinated hydrocarbons. In particular, inland wastewater treatment requirements (such as those relating to biochemical oxygen demand, suspended solids, and nutrients) were found to have little technical relevance to marine ecological problems. Other topics covered in the study (and recommended for further investigation) included diseases in nearshore fishes, indicator organisms, population and community interactions of

9.19 IMPLICATIONS OF DISPOSAL OF WASTES TO THE NORTH SEA.
(1.0146) EFFECTS ON LIVING RESOURCES, ESPECIALLY FISHERIES
(1.0147)

Cole, Herbert A. (Ministry of Agriculture, Fisheries and Food, Fisheries Laboratory, Lowestoft, England)
Chemistry and Industry, No. 4, 162-166 (Feb. 17, 1973)

Pollutants of the sea may effect living resources in several ways: (1) killing of fish at a stage in their life cycle; (2) interference with growth. physiology, behavior, and breeding of fish; (3) contamination with persistent toxic substances making fish unfit for food, and consequently, unsalable. These are direct effects, but damage may be inflicted indirectly by altering the environment (the sea water or the sea bed) so that the capacity of the sea to support fish may be damaged. Beneficial results are also possible because of additional nutrients or from selective action against predators and competitors of the fish. Killing of fish and shellfish by pollutants in the open sea is rare. Sea dilution of wastes is very rapid and mobile animals can move away from toxic levels if they choose; sessile animals, such as oysters and clams, cannot move away from pollutants that may concentrate in their environment. Highly toxic wastes are the most injurious. Pesticides such as DDT and dieldrin are toxic to adult brown shrimp at a level of 0.01 p.p.m. Pink shrimp have disappeared from the coast of England, where they were once plentiful, because of pollution. Persistent pesticide pollution may cause biological disturbances such as failure to breed or inability to avoid predators. Contamination of fish and shellfish with persistent and toxic substances also is in the realm of

9.19 ELIMINATION OF MERCURY FROM FISH

Yannai, Shmuel, and Rachel Saltzman (Dept. of Food Engineering and Biotechnology, Technion-Israel Institute of Technology, Haifa, Israel)
Journal of the Science of Food and Agriculture 24, No. 2, 157-160 (Feb. 1973)

Shredded precooked tuna fish was extracted for 2 hr. in different concentrations of dilute HCl solutions containing either 0.33% or 0.066% cysteine. The results are shown in the table that follows.

9.19 (1.0146) (1.047)

public health. Accumulation of heavy metals in food fish may cause illness and death to humans who have eaten them. Foul smelling or tasting pollutants of shellfish are lost slowly; such seafood is a financial loss to the markets, and these markets may be injured because buyers are reluctant to return to a place that sold foul shellfish. In spite of vast amounts of wastes entering the North Sea for decades from densely populated, heavily industrialized countries, the production of cod, haddock, and plaice has been unprecedented. But the production of fisheries in estuarine areas has declined. Loss of the shellfish industry can be traced directly to pollution. The countries bordering the North Sea are expected to demand greater care and restraint in the discharge of wastes into this environment.
[5 figures, 1 table, 24 references] SW

9.19

Test number	Treatment of precooked shredded tuna [1]		Mercury content [2]	Amount of mercury removed
			p.p.m.	%
1	None (control)		0.37	--
	Extracted with, dilute HCl plus 0.33% cysteine	pH 1.3	0.095	74
		pH 1.7	0.13	65
		pH 2.2	0.17	54
2	None (control)		0.53	--
	Extracted with dilute HCl plus 0.33% cysteine	pH 1.5	0.11	79
		pH 2.0	0.23	57
3	None (control)		0.39	--
	Extracted with dilute HCl plus 0.066% cysteine	pH 1.5	0.18	54

[1] The pH and the percentage of the cysteine in the solution in which the extraction was carried out.
[2] Values for treated samples adjusted for difference in moisture content from the control.

The odor and texture of the treated fish were unaffected, and a change in taste was restored by adding a small amount of salt before canning.
[2 tables, 7 references] FTP

9.19 MERCURY LEVELS IN A SAMPLE OF MICHIGAN RESIDENTS

Wilcox, Kenneth R., Jr. (Dep. Public Health, Lansing, Mich.)
Chemical Abstracts 78, No. 9, 53543w (Mar. 5, 1973)

9.19

benthic invertebrates and fishes, stimulatory and toxic effects of wastewater on phytoplankton and benthic organisms, and constituent inputs through industrial discharges, vessel-related activities, dredge spoil, surface runoff, aerial fallout, and advection.
[152 figures, 140 tables, 270 references, 557-entry bibliography, 5 appendices]
Abstractors: Staff of SCCWRP

9.19 (1.0118) MERCURY IN FISH IN THE GREAT LAKES

Bailis, Jack D. (Div. Fish., Michigan Dep. Nat. Resour., Lansing, Mich.)
Chemical Abstracts 78, No. 7, 38855f (Feb. 19, 1973)

9.19 AGRICULTURAL CHEMICALS IN THE ENVIRONMENT QUANTITATIVE VIEWPOINT

Goring, Cleve A. I. (Ag.-Org. Dep. Dow Chem. Co., Walnut Creek, Calif.)
Chemical Abstracts 78, No. 7, 39067n (Feb. 19, 1973)

9.19 POLYCHLOROBIPHENYLS IN NORTH ATLANTIC OCEAN WATER

Harvey, George R., William G. Steinhauer, and John M. Teal (Woods Hole Oceanographic Institution, Woods Hole, MA 02543)
Science 180, No. 4086, 643-644 (May 11, 1973)

The concentrations of polychlorinated biphenyls (PCBs) were measured at the surface and at various depths of the North Atlantic Ocean. The measurements were made from samples of water taken at 41 locations between 26° N. and 63° N. and 2° W. and 70° W. The samples after extraction and elution treatments, were analyzed for PCBs by electron capture gas chromatography. The results of the study showed the average concentration of PCBs to be 35 p.p.t. in surface waters and 10 p.p.t. at 200 m. deep. The surface waters of the Sargasso Sea stations were found to have slightly lower concentrations of PCBs (27 p.p.t.) than in other stations. The authors believe that the widespread distribution of PCBs in the open North Atlantic Ocean supports previous observations that winds are the dominant mode of transport. They also suggest that the presence of PCBs to depths of 3,000 m. indicates that PCBs sink as burden in dead animals and other debris out of the productive zone. This mode of action prevents higher concentrations of PCBs from accumulating in the productive zone.
[1 table, 5 references] SW

9.19 (6.)(3.18) (0.8) ODOR CONTROLS FOR RENDERING PLANTS

Bethea, Robert M. (Texas Tech University, Lubbock, TX 79409), Belur N. Murthy, and Donald F. Carey
Environmental Science & Technology 7, No. 6, 504-510 (June 1973)

The U.S. Environmental Protection Agency (EPA) is considering the development of standards of performance for new rendering plants. One of the probable standards would be to limit the concentration of undiluted odors emitted from any rendering plant to no more than 200 odor units per standard cubic foot (OU/SCF). An odor unit is the quantity of any single odorous substance or combination of substances which, when completely dispersed in 1 ft^3 of odor-free air, is detectable by a median number of observers in a panel of eight or more observers. Odor strength is related intrinsically to the olfactory sensitivity of the smeller; consequently, there is difficulty in defining the intensity of the proposed standard for any one individual.

As of Jan. 1969, there were about 850 rendering plants in the United States; of this total, 93 plants produced fish products; and the remainder were connected with meat and poultry packing operations. The authors estimated that 20 new plants will be built each year in the United States. Each will be of the continuous process type, and odor abatement equipment is expected to be an integral part of the plant.

9.19 AIR POLLUTION

Mueller, Peter K., and Evaldo L. Kothny (State of California, Dept. of Public Health, Air and Industrial Hygiene Laboratory, Berkeley, CA 94704)
Analytical Chemistry, Annual Reviews 45, No. 5, 1R-9R (Apr. 1973)

The review concentrates mostly on literature covering the occurrence and chemistry of airborne particulate matter that has appeared between July 1970 and July 1972. Devices for studying the properties of aerosols provide data on a specific integral function of composition, particle size, and sampling period. There remains a need for full descriptions of the integral function for many of the devices and techniques so that differences in their functions can be considered when comparing data. Studies of phenomena occurring at sampling nozzles were reviewed and listed. Air quality standards for particulate matter are based on visibility in miles and in micrograms per cubic meter. Efforts are continuing to find new techniques and correlations between different methods for measuring similar particulates and to establish equivalence factors among different methods. Implementation of air quality standards requires collecting particles by filtration to determine concentration and composition. New information on source of particulates is needed and other filter media are required to increase collection efficiency of total samples weighing only 10^2-10^3 µg. The piezoelectric quartz crystal application to continuous determination of particulate concentrations has problems that are unresolved. It has found use in airborne instruments to delineate plume diffusion. Size fraction separators of particles in the atmosphere and from emissions have

9.19 INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANKTON GROWTH IN COASTAL MARINE WATERS

Goldman, Joel C., Kenneth R. Tenore, and Helen I. Stanley (Woods Hole Oceanographic Institution, Woods Hole, MA 02543)
Science 180, No. 4089, 955-956 (June 1, 1973)

Phosphorus has traditionally been viewed as the growth-limiting nutrient in coastal and estuarine environments. In contrast, other reports provide evidence that nitrogen is the phytoplankton growth-limiting nutrient in these environments, and by removing nitrogen from wastewaters, eutrophication may be controlled in the receiving aquatic system.

Experiments were performed to determine the effects of nitrogen removal on the growth of algae in wastewater. Nutrients (mainly nitrogen) were removed from secondarily treated domestic wastewater (diluted with sea water) by allowing marine phytoplankton to grow in it. The effluent from the pond, after this treatment, would not support more phytoplankton growth than sea water alone (without wastewater). When nitrogen (as NH_4Cl) was added back to the mixture of spent effluent and sea water in the pond, the growth response was similar to that with a mixture of unchanged wastewater and sea water. It is this finding which causes the authors to conclude that nitrogen may be the major growth limiting nutrient in coastal marine waters. Tests for phosphate removal in the algal growth system showed that there was a gross excess of phosphorus over nitrogen in the secondarily treated wastewater relative to normal requirements of phytoplankton. The combining of a

9.19

been reported. Cyclones consisting of combining centrifugation, impaction, and filtration have been developed and evaluated for obtaining size distributions and fractions which simulate deposition in respiratory airways. Publications are listed concerning the application of various forms of microscopy to X-ray emission microprobe analysis and computer images to determine the origin of particles. An atlas has been prepared to assist in identification of asbestos and similar fibers by electron microscopy. In the determination of chemical elements in air pollution, the two largest groups have been determined by thermal neutron activation and by X-ray fluorescence. Satisfactory data have not been obtained by these methods for elements of atomic number below 20. Development of the heated graphite oven for sample pretreatment are promising. Analysis of organic emissions and concentrations in air continues to be provided by gas chromatography-mass spectrometry techniques.
[4 tables, 383 references] SW

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tertiary treatment of wastewater with phytoplankton and a marine aquaculture activity (such as oysters), that would consume the phytoplankton, appears to be a means of removing nitrogen from secondarily treated wastewater and thus controlling eutrophication of coastal marine waters. The production of food from the aquaculture system would be an added benefit.
[1 figure, 1 table, 8 references] SW

9.19 INSECTICIDES

Edwards, Clive Arthur (Dep. Entomol. Rothamsted Exp. Stn., Harpenden/Hertfordshire, England)
Chemical Abstracts 78, No. 7, 39068p (Feb. 19, 1973)

9.19 RESIDUES OF DDT IN COD FROM NORWEGIAN FJORDS
(1.51)

Bjerk, J. E. (Veterinary College of Norway, Oslo, Norway)
Bulletin of Environmental Contamination and Toxicology 9, No. 2, 89-97 (Feb. 1973)

The use of DDT as an insecticide has been prohibited in Norway since Oct. 1, 1970. The residual decrease in the environment of DDT has been monitored since then. This paper is a report on residues of DDT in cod taken from local Norwegian waters after DDT was prohibited. Cod taken from the fjords of four districts were examined. At district A there are large fruit orchards and a small forest nursery. At district C there are fruit orchards and at district B a forest nursery only. These three districts had residual DDT from spraying operations. District D had no local source of DDT contamination. The DDT levels in livers of cod taken from Fjords at districts A and C were high, ranging from 12 to 40 p.p.m., wet weight. Cod taken near districts B and D had liver DDT levels of 2.6 and 1.8 p.p.m., respectively. At district A, cod taken near the mouth of the fjord had lower levels of DDT than those caught near the head of the fjord. The author attributed runoff from the fruit orchards as the cause of high DDT levels in cod livers.
[1 figure, 3 tables, 16 references] SW

9.19 (6.) (3.18) (0.8)

Combustion or thermal incineration is the most effective method for controlling high-concentration odors in low volumes of air. Complete oxidation of odorous gases is necessary, otherwise the partial oxidation products may be more odoriferous than the original gaseous effluents. Catalytic oxidation may be used for control of odors, but the process requires a catalyst that will not be poisoned by particulate matter or sulfur compounds. Catalytic oxidation uses less fuel but requires a higher investment cost than thermal incineration. Odor removal by gas scrubbing with water is limited because many of the components in rendering odors are insoluble in water. Reactive scrubbing using solutions of reagents can be used, but the products of the reaction should be inert precipitates. Maintaining reagent strength, corrosion, and costs of reagents can deter use of reactive scrubbing. Ozonation, adsorption, and masking of odorous compounds can also be useful processes in odor control.

The authors suggest that further research into the following areas may be potentially beneficial: poison resistant catalysts, analytical techniques and instrumentation for identification and quantification of odor components in process streams, freezing or refrigeration of materials prior to rendering, solvent extraction as an alternative to high temperature cooking operations, and better housekeeping in plant operations.
[4 figures, 2 tables, 5 references] SW

9.2 SYSTEMS ANALYSIS AND SIMULATION IN ECOLOGY. VOLUME II
(9.6)

Patten, Bernard C. (editor) (Dept. of Zoology, University of Georgia, Athens, GA 30601)
Academic Press, Inc., New York, N.Y. (1972), xvi + 529 pp. Price not given.

Volume I of this series covered ecological modeling and ecosystem simulation. In this volume II, 16 authors contributed articles in three major subdivisions. Part I is an introduction to systems science for ecologists. Part II covers steady-state analysis of energy flow in ecosystems with sensitivity analysis. Part III is theoretical in tone. It contains descriptions of an energy circuit language for ecosystems and structural properties of ecosystems. Part IV contains applications of systems analysis to fisheries problems, management and training, environmental court actions, human society, and future models in ecology. Each of these subdivisions is concluded with a bibliography, and there are author and subject indexes.

The author believes that systems science as evolved for physical systems must be joined with the subject matter and methods of traditional ecology to provide a new science of systems ecology. SW

9.3 SCIENTIFIC ADVICE ON CATCH LEVELS
(9.17)

Gulland, J. A., and L. K. Boerema (Dept. of Fisheries, FAO, Rome, Italy)
Fishery Bulletin 71, No. 2, 325-335 (Apr. 1973), National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98105.

The sustainable yield, or maximum sustainable yield, has been used to provide, on an objective scientific basis, target figures for the catches to be taken from a heavily exploited stock that is under regulation. The simple concept of sustainable yield does not, however, provide a completely adequate guide when the biological system is complex. Certain other quantities--the replacement yield, the sustainable yield from a stock in equilibrium, the maintainable yield, and the catch for desired harvesting rate--are defined which correspond more closely to the biological reality.

One or other of these will provide a better guide for management, depending on the nature of the divergence from the simple model. In whale populations the major divergence is the lag between changes in adult stock and changes in recruitment; replacement yield or maintainable yield are the most useful. In many fish stocks, fluctuations in year-class strength are more important: catch for desired harvesting rate may be better.
[3 figures, 2 tables, 7 references] Authors' abstract

9.2 A STUDY OF THE SOCIOECONOMIC IMPACT OF CHANGES
(1.0115)(1.87) IN THE HARVESTING LABOR FORCE IN THE MAINE LOBSTER INDUSTRY

Huq, A. M. (University of Maine, Orono, ME 04473)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 159-173.

The basic question of the mobility of the labor force in the Maine lobster fishery is investigated with particular emphasis on the productivity of control groups within a sample and their social, educational, economic, and demographic characteristics. Under various assumptions which would lead to exit from the fishery of these groups certain consequences are enumerated, both with regard to those leaving and those remaining as well as the impact on and role of the local communities involved. A preliminary assessment of the impact of certain types of management programs upon the labor component of the harvesting sector is presented.
[1 figure, 13 tables] Author's abstract

9.3 THE LATIN AMERICAN APPROACH TO THE LAW OF THE SEA

Samet, Jan H., and Robert L. Fuerst (Law School, University of North Carolina)
Sea Grant Publication UNC-SG-73-08, Sea Grant Program, School of Public Health, University of North Carolina, Chapel Hill, NC 27514 (Mar. 1973), 165 pp.

In this publication the authors present and analyze the positions of the Latin American countries regarding the law of the sea. Much of the material has not previously been conveniently available. The authors present the philosophy and historical development of Latin American claims to 200-mile territorial waters; discuss the individual views and laws of most of these nations regarding the exercise of jurisdiction in the "patrimonial sea" areas contiguous to their coasts; and examine in detail the national statutes dealing with the exploration and exploitation of off-shore mineral and living marine resources. Also, they discuss the impact of Latin American thought and action on the evolving law of the sea.
[466 footnotes, 7 appendixes] FTP

9.2 (9.19) COST-BENEFIT ANALYSIS AND THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Burmeister, Edward D., Jr.
Stanford Law Review 24, 1092-1116 (June 1972)

Recent interpretations of subsections 102(2) (A)-(C) of the National Environmental Policy Act of 1969 indicate that Federal officials are required to evaluate proposed actions falling within the scope of the Act by means of cost-benefit analysis, and that environmental values be incorporated into that analysis, along with traditional economic and technical elements. Cost-benefit analyses are now required as part of the environmental impact statements prepared by the Atomic Energy Commission with regard to Federal projects the Agency licenses, and new procedures have been proposed for evaluating Federal water projects which alter the traditional cost-benefit techniques to provide for consideration of environmental factors. The present article analyzes these developments, examines the general assumptions and limitations of cost-benefit analysis, and discusses the dangers inherent in attempting to incorporate environmental values into this analytical framework.

The author concludes that the traditional model of cost-benefit analysis, with its single criterion of national income, is ill designed to achieve proper consideration of environmental factors. He believes that a multiobjective approach, similar to that proposed by the Water Resources Council for use in evaluating Federal water projects, meets many of the objections to the traditional model. Nevertheless, to insure effectiveness and good faith in Agency consideration of environmental factors, he believes it will be necessary for Congress and the Council on Environmental Quality to define classification systems, priorities, and guidelines for Federal Agency officials to follow in making the important trade off decisions involved in planning Federal projects that affect the environment.
[164 footnotes]

FTP

9.3 (9.6) LAW OF THE SEA: OCEANIC RESOURCES

Jones, Erin Bain
Southern Methodist University Press, Dallas, Tex. (1972), 162 pp. Price $7.95.
Ann Van Wynen Thomas (reviewer)
Journal of Air Law and Commerce 39, No. 1, 139-140 (Winter 1973)

This book makes possible a better understanding of the complexities of the international law of the sea, its evolution, and its application to oceanic resources. It should be of interest to international lawyers, scientists, ecologists, explorers of the deep sea, and business entrepreneurs. The author first describes the advanced technology of oceanic exploitation and reviews the various laws governing oceanic areas starting from the ancient Roman era. She then traces the results of the various international conferences that have considered the law of the sea.

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9.2 (9.3) ECONOMIC, POLITICAL, AND SOCIAL BARRIERS TO EFFICIENCY IN SELECTED PACIFIC COAST FISHERIES

Crutchfield, James A. (University of Washington, Seattle, Wash.)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 28-38.

Multidisciplinary models are being developed for the salmon, halibut, king crab and anchovy fisheries as an aid in fisheries management. These models will provide estimates of economic rent in these fisheries, with an evaluation of alternative management structures available to capture these net benefits. The character of the models for each of these differing fisheries is described, including reference to the nature of the products, markets, processors, harvesters, regulators, stocks, and locations sectors of these fisheries. Introductory observations are made on the future role of multifishery modeling studies.
[2 figures, 6 references, appendix]

Author's abstract

9.2 (9.3) PROBLEMS IN IMPLEMENTING NEW FISHERY MANAGEMENT PROGRAMS

Van Meir, Lawrence W. (National Canners Assoc., Washington, D.C.)
NOAA Technical Report NMFS CIRC-371, National Marine Fisheries Service, NOAA, U.S. Dept. of Commerce, Seattle, WA 98115 (Apr. 1973), pp. 9-11.

The problem of fishery management raises two questions: (1) What benefits will be sought in managing fisheries and (2) to whom will the benefits accrue? Most fishery management programs remain oriented to the conservation of fish stocks with no consideration of the economic results. Common property status must be replaced by explicit fishing rights. In the process of conserving fish stocks we must bring these specific fishing rights in balance with the allowable yield of the resource in a manner that not only permits efficiency but also promotes economic efficiency and technological development. Some system must be developed to limit the amount of labor and capital employed in harvesting the allowable catch and at the same time assure that the labor and capital is used in an economically efffi-cient manner.

Even though an "optimum" management program, in an economic sense, may never be achievable in the management of commercial fisheries, changes can be initiated which will allow individual governments to realize economic gains over the status quo in harvesting common property fishery resources. These changes primarily involve jurisdictional issues; country quotas for international fisheries; accord between the Federal government and the states; and a within-industry system for allocating fishing rights. A system of vessel licensing is described with reference to the ultimate use of licenses on units of fishing effort.

Author's abstract and extracted in part

9.3 U.S. FOREIGN POLICY FOR THE 1970'S
SHAPING A DURABLE PEACE. A REPORT TO THE CONGRESS

Nixon, Richard (President of the United States)
Department of State Bulletin 68, No. 1771, 717-834 (June 4, 1973)

Card A

The following material was extracted in part from pages 825-827 of the text of the President's Report of May 3, 1973 to the Congress under "Part VII: New International Challenges," The Global Challenges of Peace (The Oceans, Territorial Seas and Straits, and Marine Resources).

As man's activities in the oceans intensify, the need for international accommodation is clear. Serious efforts are now being made in the United Nations to work out new rules and develop institutions to ensure the rational future use of the marine environment.

As a major maritime power and a leader in ocean technology, the United States has a special responsibility for this international effort to reach agreement on the peaceful use of the world's oceans. Together with more than 90 other nations, we are making intensive preparations for a comprehensive Law of the Sea Conference called for by a resolution of the United Nations General Assembly. We have introduced detailed proposals, relating to the seabed and seabed resources, living marine resources, the breadth of the territorial sea, and freedom of transit through and over international straits. These proposals are designed to accommodate the

9.3 U.S. FOREIGN POLICY FOR THE 1970'S
SHAPING A DURABLE PEACE. A REPORT OT THE CONGRESS

Nixon, Richard (President of the United States)
Department of State Bulletin 68, No. 1771, 717-834 (June 4, 1973)

Card B

resources and fisheries should be tempered by international standards that respect the interests of other states and the international community.

Internationally-agreed limitations on seabed resources should include:

--Standards to prevent unreasonable interference with other uses of the ocean, to protect the oceans from pollution, and to safeguard the integrity of investment;

--Sharing of revenues for international community purposes; and

--Compulsory third-party settlement of disputes to help reduce the potential for conflict.

We believe coastal states should have special management authority and preferential rights with regard to fisheries stocks in their coastal waters or those that spawn in their rivers. We have proposed to make these rights correspond to the biological characteristics of the fish involved. Our proposal provides for broad coastal state jurisdiction and preferences over coastal and anadromous fisheries, such as salmon, beyond the territorial sea, with international standards for conservation, maximum utilization, equitable

9.3 THE ANGLO-ICELANDIC FISHERIES DISPUTE

Bilder, Richard B. (University of Wisconsin, Madison, WI 53706)
Wisconsin Law Review 1973, No. 1, 37-132 (1973)

On Sept. 1, 1972, Iceland issued regulations to extend its fishing limits from 12 nautical miles to 50. This regulation, in effect, asserted Iceland's claim to an exclusive fisheries zone roughly to the area of its continental shelf. Both the United Kingdom and the Federal Republic of Germany protested Iceland's action and have refused to recognize Iceland's asserted fisheries limits. Furthermore, both countries have instituted proceedings against Iceland in the International Court of Justice claiming that Iceland's actions violated international law. This controversy is interesting and important for four reasons: (1) Fisheries disputes are an important and recurring source of international disputes. The Icelandic fisheries problem illustrates the nature of the claims and interests that are at stake, and suggests the potential role and limitations of international law in adjusting such disputes. (2) Iceland's extention of its fisheries limits is an example of the growing number of recent attempts by coastal states to extend their jurisdiction over broad areas of the seas for fisheries, prevention of pollution, and for other purposes. (3) The dispute occurs in the context of worldwide preparations for the United Nations Law of the Sea Conference scheduled to first convene in Nov. 1973. The Conference will undoubtedly result in some changes in the law of the sea. (4) The Icelandic problem raises important legal issues respecting the law of international agreements, the nature of international customary

9.7 CONSUMER REACTION TO NUTRITIONAL LABELS ON FOOD PRODUCTS

Lenahan, R. J., J. A. Thomas, D. A. Taylor, D. L. Call, and D. I. Padberg (Cornell University, Ithaca, NY 14850)
Journal of Consumer Affairs 7, No. 1, 1-12 (Summer 1973) (University of Wisconsin Press, Box 1379, Madison, WI 53701)

To design the most useful instruments for consumer protection, we must first understand how consumers perceive and use such instruments. We may tend to make information on labels complete as viewed by the expert rather than useful in the normal behavior of the consumer. This study was designed to determine how consumers perceive nutritional labels on food products. The study was carried out in two parts. The first part involved 2,915 interviews (a national probability sample of the population) which searched in depth the projected attitudes toward nutritional labeling. The second part was a less intensive personal interview of 4,435 shoppers in several cities in supermarkets in which a test of a nutritional labeling program was being operated.

The study was designed to find out the extent of use of the labels in the purchase decision and to determine the consumers' attitude toward the labels. The basic objectives were: (1) to determine the form of nutritional information most useful to consumers, (2) to determine the rate of perception, understanding, and use of nutritional labels in actual tests, and (3) to examine the nature and importance of nonuse benefits perceived by consumers.

The findings were: (1) The consumers favor a label format that gives nutritional values as a percent of the recommended daily allowance for the nutrient.

9.3

allocation, and compulsory third-party settlement of disputes. On the other hand, our proposal provides that highly migratory fish, such as tuna, would be regulated by international organizations in which all interested fishing and coastal states could participate. We have suggested that during the law of the sea negotiations a formula be devised to determine what part of the allowable catch is to be left to traditional distant water fisheries.

Extracted

9.3 DOCUMENTS IN THE LAW OF THE SEA (9.6)

Churchill, Robin (British Institute of International and Comparative Law), Myron Nordquist (U.S. Dept. of State), and S. Houston Lay (California Western Law School) (compilers)
British Institute of International and Comparative Law, 32 Furnival St., London EC4A 1JN (Co-published with Oceana Publications Ltd., New York, N.Y.) (Jan. 1973), 911 pp. Price £15. (Two volumes). FTP

9.7

(2) In the supermarket tests, about 25% of the consumers were aware of the labeling, about 15% understood the labels, and less than 10% used the labels. (3) More intensive promotion increases consumer perception, but has little effect on his understanding and use of them. (4) Consumer understanding and use of nutritional labels seem to increase with the duration of the test program. (5) Increases in nutritional knowledge and sensitivity appear associated with the duration of the nutritional labeling program. (6) Recognition of nonuse benefits is much broader among consumers than is the direct use of the nutritional labels. (7) The recognition of nonuse benefits is correlated highly with educational level and income. Nonuse benefits recognized by respondents were: (1) Nutritional information will increase consumer confidence in the food industry; (2) Manufacturers will try harder to make their products nutritious if they have to show nutritional information; (3) Nutritional labels encourage advertising that will help advance consumer education; (4) More information indicates greater concern for the consumer's welfare; and (5) Consumers have the right to know the nutritional value of market food products.

This article is a substantial condensation of the original which was published as follows:

"Consumer Reaction to Nutritional Information on Food Product Labels," Search vol. 2, no. 15, Cornell University, Ithaca, N.Y. (1972). FTP

9.3

diverse interests of many nations and to permit all to use the seas more effectively and harmoniously.

...The United States has presented to the UN Seabed Committee draft treaty articles providing for:

--a territorial sea with a maximum breadth of 12 nautical miles, together with and conditional on

--a right of free transit through and over straits used for international navigation.

We firmly believe that 12 miles represents the only figure on which general agreement among nations is possible, and there has been growing consensus on this view in the international community.

Many straits used for international navigation are less than 24 miles wide. Twelve-mile territorial seas might thus overlap. Accordingly, the United States has made a provision for a specific right of "free transit" a condition to our agreement to a 12-mile territorial sea. This would preserve the right of transit through and over international straits for ships and aircraft. The U.S. proposal is designed to accommodate the concerns of nations bordering such straits with respect to traffic arrangements and pollution control.

With respect to marine resources generally, the United States is willing to agree to broad coastal state economic jurisdiction beyond the territorial sea as part of a satisfactory overall law of the sea settlement. But this management jurisdiction over mineral

[Continued on Card B]

9.3

law, the role of the International Court of Justice, the strategy and tactics of international legal controversy, and the workings of the international legal process. This article covers the various aspects of the dispute primarily between Iceland and the United Kingdom and includes:

Background;
Diplomatic History;
The Legal Issues:
  The Validity and Effect of the International Courts Interim Order,
  The Jurisdiction of the International Court Over the Dispute: The Applicability of the Compromissory Clause in the 1961 Agreement,
  The Legality of Iceland's 50-Mile Fisheries Limits;
Other Aspects of the Dispute:
  Interrelations of the Case, the Conference, and the Parties Tactics,
  The Role of International Adjudication,
  The Role of Unilateral State Action in International Legal Change;
Prospects; and
Conclusion.

[370 footnotes] FTP

9.4 (9.5) DIRECTORY OF CONSUMER PROTECTION AND ENVIRONMENTAL AGENCIES

Reitman, Jerry I., and Thaddeus C. Trzyna
Academic Media, Orange, NJ 07050 (1973), Ed. 1, 627 pp.

This directory contains a list of governmental and private organizations involved in consumer and environmental protection activities in the United States. It is divided into two sections: "Consumer Protection" and "Environmental Protection." The "Consumer Protection" section includes those agencies that are concerned with the right of the consumer in the marketplace to safety, freedom of choice, adequate information, sources of redress, quality, and integrity. The "Environmental Protection" section includes those agencies that are concerned with the quality of the natural and physical environment involving problem areas of land use management, city and regional planning, preservation of wilderness and natural areas, forestry, soil conservation, water resources management and planning, air and water pollution control, marine resources, management and protection of flora and fauna, pesticides, radiation, outdoor recreation resources, population planning and control, waste management, transportation planning, noise control, nonrenewable resources, and weather modification.

The list includes all Federal Government agencies, the major State agencies, and the most important private groups. The principal agencies of the 50 largest cities in the United States are included. Organization, Personnel, Publication, and Subject indexes are included. FTP

9.7 UNIVERSITY CURRICULA IN THE MARINE SCIENCES AND RELATED FIELDS. ACADEMIC YEARS 1973-1974, 1974-1975

Anonymous
Produced by the Marine Technology Society, 1730 M Street, N.W., Washington, DC 20036 (1973), xv + 165 pp. Price not given.

This bulletin contains information on the colleges and universities that teach marine courses. It should provide invaluable assistance to students planning a career in the marine sciences and to anyone who needs up-to-date information on what academia has to offer in this field. The information was furnished by officials at each educational institution. The reports from each of these institutions are organized as follows:

A description of the facilities available, including research labs and vessels;

The degree programs in the marine field, usually with the entrance and course requirements specified;

A list of the marine courses offered and the credit given, according to each school's system;

A list of the faculty members involved with the degree programs, alphabetically and in most cases with the highest degree earned; and

The name of the contact person for further information. FTP

9.7 (9.6) GUIDE TO LOCATING U.S. GOVERNMENT TECHNICAL INFORMATION, TECHNOLOGY AND PATENTS

Anonymous
TTA Information Services Co., P.O. Box 11977, Chicago, IL 60611 (Date and number of pages not given.) Price $15.00.
Research Management 16, No. 2, 38 (Mar. 1973)

Details of four major types of sources of government-generated technical knowledge and patents are given. These are: (1) general sources, such as the Superintendent of Documents, U.S. Government Printing Office and the Library of Congress; (2) individual agency sources, such as the National Referral Center, National Aeronautics and Space Administration, Science Information Exchange; (3) technology transfer services, including the various information and data services; and (4) patents and licenses, including a list of U.S. Patent Depository Libraries in the United States. FTP

9.8 (9.6) ECOLOGICAL DIVERSITY

Mellanby, Kenneth (reviewer)
(1) A Natural Ecology
Michael Graham
Manchester University Press, 252 pp. £1.80
(2) Dynamic Ecology
Boyd D. Collier, George W. Cox, Albert W. Johnson, and Philip C. Miller
Prentice-Hall, 564 pp. npg
(3) Natural Environments--Studies in Theoretical and Applied Analysis
John V. Kruttila (editor)
John Hopkins University Press, 352 pp. £7.45
New Scientist 58, No. 849, 631 (June 7, 1973)

(1) The book "A Natural Ecology" is based on a series of lectures in the biology department of Salford University and deals with all the normal topics in a course on ecology.

(2) The book "Dynamic Ecology" is intended as a text for advanced students and was prepared by four members of the faculty of California State University, San Diego.

(3) The book "Natural Environments--Studies in Theoretical and Applied Analysis" is written mainly by economists. The writers attempt to extend the principles of cost-benefit analysis to studies of the natural and wilderness areas. FTP

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GPO 988-678

THE SECRETARY OF COMMERCE HAS DETERMINED THAT THE PUBLICATION OF THIS PERIODICAL IS NECESSARY IN THE TRANSACTION OF THE PUBLIC BUSINESS REQUIRED BY LAW OF THIS DEPARTMENT. USE OF FUNDS FOR PRINTING THIS PERIODICAL HAS BEEN APPROVED BY THE DIRECTOR OF THE OFFICE OF MANAGEMENT AND BUDGET THROUGH FEBRUARY 15, 1974.

MARINE FISHERIES ABSTRACTS

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